NEC

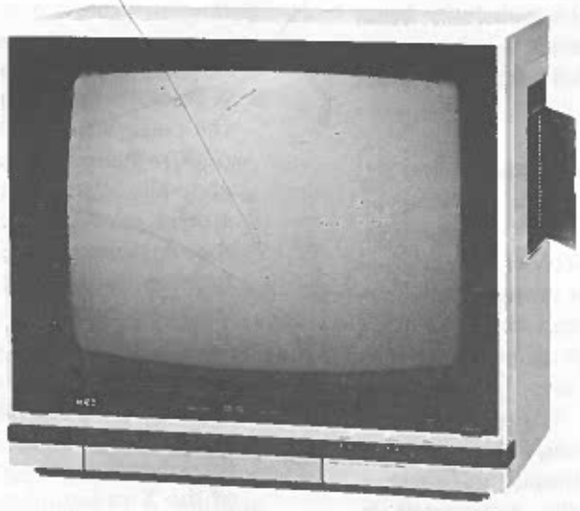
MODEL CT1901A/CT2501A

COLOR TELEVISION MONITOR

SERVICE MANUAL

CODE No. 399910213

Better Service
Better Reputation
Better Profit



NEC Corporation
TOKYO, JAPAN

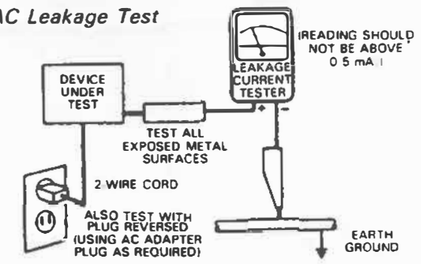
SAFETY PRECAUTIONS

1. **Before returning an instrument to the customer,** always make a safety check of the entire instrument, including, but not limited to, the following items:
   a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing. (1) Protective shields are provided on this chassis to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience. (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks. **Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning.**
   b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, but are not limited to, (1) spacing between the picture tube and the cabinet mask, (2) excessively wide cabinet ventilation slots, and (3) an improperly fitted and/or incorrectly secured cabinet back cover.

   c. **Antenna Cold Check** — With the instrument AC plug removed from any AC souce connect an electrical jumper across the two AC plug prongs. Place the instrument AC switch in the on position. Connect one lead of an ohmmeter to the AC plug prongs tied together and touch the other ohmmeter lead in turn to each tuner antenna input exposed terminal screw and, if applicable, to the coaxial connector. If the measured resistance is less than 1.0 megohm or greater than 5.2 megohm, an abnormality exists that must be corrected before the instrument is returned to the customer. Repeat this test with the instrument AC switch in the off position.

   d. **Leakage Current Hot Check** — With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) *C101.1 Leakage Current for Appliances* and Underwriters Laboratories (UL) *1410, (50.7)*. With the instrument AC switch first in the on position and then in the off position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the instrument power cord plug in the outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**

AC Leakage Test


READING SHOULD NOT BE ABOVE 0.5 mA
LEAKAGE CURRENT TESTER
DEVICE UNDER TEST
TEST ALL EXPOSED METAL SURFACES
2 WIRE CORD
ALSO TEST WITH PLUG REVERSED (USING AC ADAPTER PLUG AS REQUIRED)
EARTH GROUND

   e. **X-Radiation and High Voltage Limits** — Because the picture tube is the primary potential source of X-radiation in solid-state TV receivers, it is specially constructed to prohibit X-radiation emissions. For continued X-radiation protection, the replacement picture tube must be the same type as the original. Also, because the picture tube shields and mounting hardware perform an X-radiation protection function, they must be correctly in place.
   High voltage must be measured each time servicing is performed that involves B+, horizontal deflection or high voltage. Correct operation of the X-radiation protection circuits also must be reconfirmed each time they are serviced. (X-radiation protection circuits also may be called "horizontal disable" or "hold-down.") Read and apply the high voltage limits and, if the chassis is so equipped, the X-radiation protection circuit specifications given on instrument labels and in the *Product Safety & X-radiation Warning* note on the service data chassis schematic.
   High voltage is maintained within specified limits by close-tolerance safety-related components/adjustments in the high-voltage circuit. If high voltage exceeds specified limits, check each component specified on the chassis schematic and take corrective action.

2. Read and comply with all caution and safety-related notes on or inside the receiver cabinet, on the receiver chassis, or on the picture tube.

3. **Design Alteration Warning** — Do *not* alter or add to the mechanical or electrical design of this TV receiver. Design alterations and additions, including, but not limited to, circuit modifications and the addition of items such as auxiliary audio and/or video output connections, might alter the safety characteristics of this receiver and create a hazard to the user. Any design alterations or additions will void the manufacturer's warranty and will make you, the servicer responsible for personal injury or property damage resulting therefrom.

4. **Picture Tube Implosion Protection Warning** — The picture tube in this receiver employs integral implosion protection. For continued implosion protection, replace the picture tube only with one of the same type number. Do *not* remove, install, or otherwise handle the picture tube in any manner without first putting on shatterproof goggles equipped with side shields. People not so equipped must be kept safely away while picture tubes are handled. Keep the picture tube away from your body. Do not handle the picture tube by its neck. Some "in-line" picture tubes are quipped with a permanently attached deflection yoke; because of potential hazard, do *not* try to remove such "permanently attached" yokes from the picture tube.

5. **Hot Chassis Warning** — **a.** Some TV receiver chassis are electrically connected directly to one conductor of the AC power cord and may be safely serviced without an isolation transformer only if the AC power plug is inserted so that the chassis is connected to the *ground* side of the AC power source. To confirm that the AC power plug is inserted correctly, with an AC voltmeter measure between the chassis and a known earth ground. If a voltage reading in excess of 1.0V is obtained, remove and reinsert the AC power plug in the opposite polarity and again measure the voltage potential between the chassis and a known earth ground. **b.** Some TV receiver chassis normally have 85V AC (RMS), between chassis and earth ground regardless of the AC plug polarity. These chassis can be safely serviced only with an isolation transformer inserted in the power line between the receiver and the AC power source, for both personnel and test equipment protection. **c.** Some TV receiver chassis have a secondary ground system in addition to the main chassis ground. This secondary ground system is *not isolated* from the AC power line. The two ground systems are electrically separated by insulating material that must not be defeated or altered.

6. Observe original lead dress. Take extra care to assure correct lead dress in the following areas: a. near sharp edges, b. near thermally hot parts — be sure that leads and components do not touch thermally hot parts, c. the AC supply, d. high voltage, and e. antenna wiring. Always inspect in all areas for pinched, out-of-place, or frayed wiring. Do not change spacing between components, and between components and the printed-circuit board. Check AC power cord for damage.
7. Components, parts, and/or wiring that appear to have overheated or are otherwise damaged should be replaced with components, parts, or wiring that meet original specifications. Additionally, determine the cause of overheating and/or damage and, if necessary, take corrective action to remove any potential safety hazard.
8. **PRODUCT SAFETY NOTICE** — Many TV electrical and mechanical parts have special safety-related characteristics some of which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified in this service data by shading with a ⚠ mark on schematics and by shading or a ⚠ mark in the parts list. Use of a substitute replacement part that does not have the same safety characteristics as the recommended replacement part in this service data parts list might create shock, fire, and/or other hazards.

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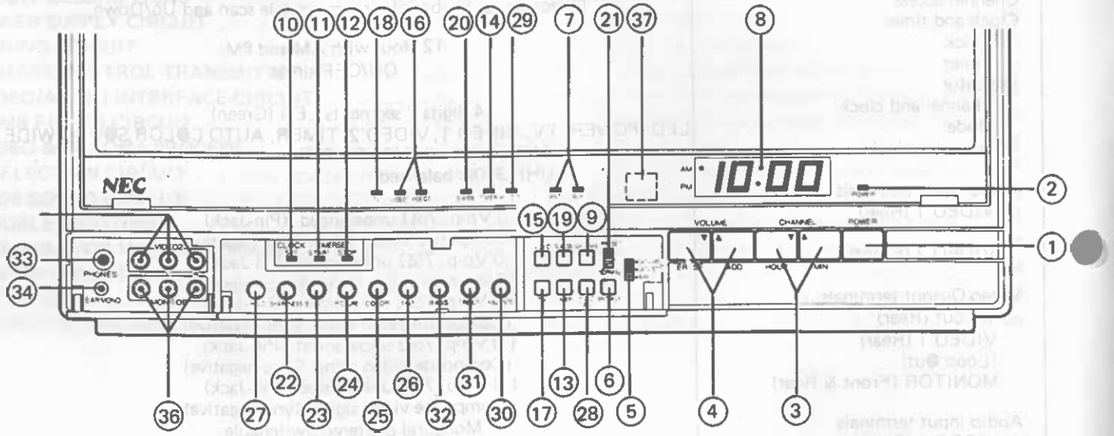
SPECIFICATIONS

DESCRIPTIONS \ MODEL	CT-2501A	CT-1901A
Television System	American standards	
Channel coverage	VHF Channels 2-13 UHF Channels 14-83 CATV (Standard and H.R.C. selectable) midband channels A5-A1, A-I superband channels J-W hyperband channels AA-WW	
Tuning system	134 channel frequency synthesized tuning system with nonvolatile channel memory circuit for channel Up/Down.	
Channel access	Direct access keyboard, programmable scan and Up/Down	
Clock and timer		
Clock	12 Hour with AM and PM	
Timer	ON/OFF timer	
Indicator		
Channel and clock	4 digits 7 segments LED (Green)	
Mode	LED (POWER, TV, VIDEO 1, VIDEO 2, TIMER, AUTO COLOR, SOUND WIDE	
Antenna terminals	ANT. AUX) VHF/CATV 75Ω unbalanced (F-type) UHF 300Ω balanced	
Video input terminals		
VIDEO 1 (Rear)	1.0 Vp-p, 75Ω unbalanced. (Pin-Jack) (Composite Video signal Sync-negative)	
VIDEO 2 (Front)	1.0 Vp-p, 75Ω unbalanced (Pin-Jack) (Composite video signal Sync-negative)	
Video Output terminals		
TV out (Rear)	1.0 Vp-p, 75Ω unbalanced (Pin-Jack) (Composite video signal Sync-negative)	
VIDEO 1 (Rear) (Loop Out)	1.0 Vp-p, 75Ω unbalanced (Pin-Jack) (Composite video signal Sync-negative)	
MONITOR (Front & Rear)	1.0 Vp-p, 75Ω unbalanced (Pin-Jack) (Composite video signal Sync-negative)	
Audio input terminals		
VIDEO 1 (Rear)	Monaural & Stereo Switchable. Left: (Mono) 0.4 Vrms, high impedance (Pin-Jack) Right: 0.4 Vrms, high impedance (Pin-Jack)	
VIDEO 2 (Front)	Left: (Mono) 0.4 Vrms, high impedance (Pin-Jack) Right: 0.4 Vrms high impedance (Pin-Jack)	
TV MULTIPLEX (Rear)	Left: 0.4 Vrms high impedance (Pin-Jack) Right: 0.4 Vrms high impedance (Pin-Jack)	
Audio output terminals		
TV out (Rear)	Mono: Audio input signal 0.4±0.1 Vrms, less than 10kΩ (Pin-Jack) Left: Audio input signal 0.4±0.1 Vrms, less than 10kΩ (Pin-Jack)	
VIDEO 1 (Rear)	Right: Audio input signal 0.4±0.1 Vrms, less than 10kΩ (Pin-Jack)	
MONITOR (Front & Rear)	Left: Audio input signal 0.4±0.1 Vrms, less than 10kΩ (Pin-Jack) Right: Audio input signal 0.4±0.1 Vrms, less than 10kΩ (Pin-Jack)	
External Speaker output terminals	Left: 5W (THD 1%), 8Ω Right: 5W (THD 1%), 8Ω	
Sound Output		
Internal	2.5 W + 2.5W (THD 1%)	
External	5W + 5W (THD 1%)	
Intermediate frequency		
Picture IF carrier	45.75 MHz	
Color sub-carrier	42.17 MHz	
Sound IF carrier	41.25 MHz	
Frequency coverage	54 MHz – 438 MHz	470 MHz – 890 MHz
Remote Control		
Transmission system	Digitally encoded infrared light.	
Functions	Direct access channel selection by 10 keys, power ON/OFF, volume control UP/DOWN, audio mute, channel UP/DOWN, time/channel, and ANT/AUX.	
Batteries	Two 1.5V Pen-light (Type UM-3)	
Battery life	1 yr, in normal use.	
Power requirements	AC-120V, 60Hz	
Power consumption (Maximum)	145W	123W
Picture tube	(Shadow maske type, PIS pincusion free)	
Type	670 DRB22	510 YWB22
Visual size	25" (Diagonal)	19" (Diagonal)
Speaker	Oval type 3" x 5" x 2, 16Ω	Oval type 3" x 5" x 2, 16Ω
Dimensions	64.0 W x 59.0 H x 52.0 D cm 25-1/5" W x 25-1/5" H x 20-2/5" D	51.4 W x 46.8 H x 4.75D cm 20-1/5" W x 18-2/5" H x 18-7/10 D
Weight	41 kg/90.3 lb	28 kg/61.7 lb

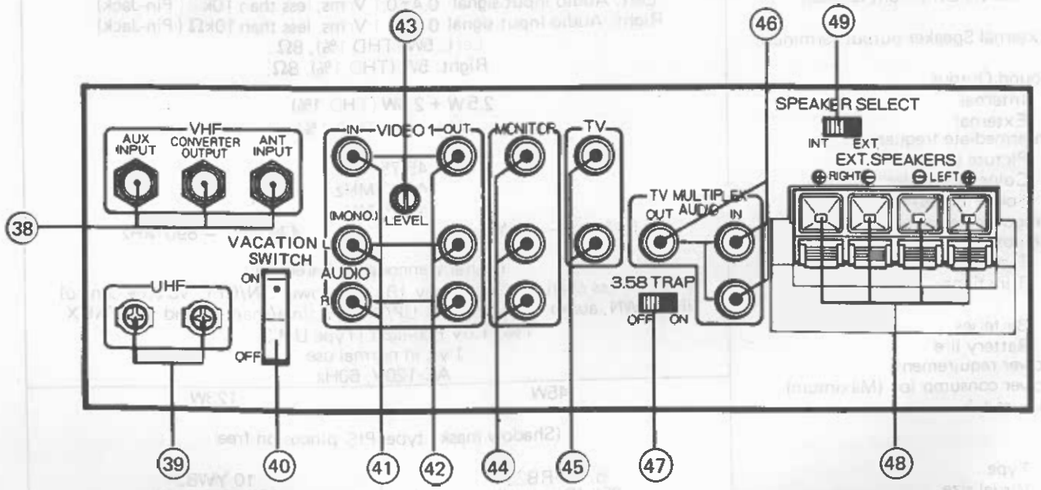
All specifications subject to change without notice.

LOCATION OF CONTROLS

FRONT PANEL



REAR PANEL



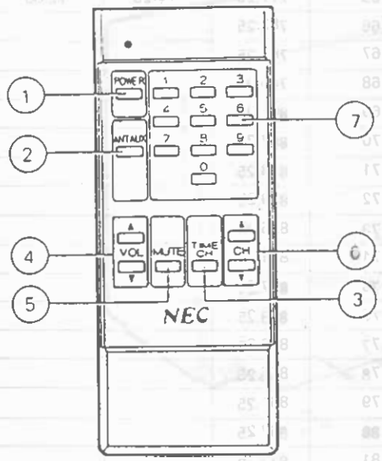
FRONT PANEL

1. POWER Switch
2. POWER Light
3. CHANNEL Up: Down/HOUR, MIN, Buttons
4. VOLUME/ERASE, ADD Buttons
5. Channel Plan Switch
6. ANT/AUX Button
7. ANT/AUX Light
8. CH/TIME Display
9. CH/TIME Button
10. CLOCK SET Button
11. TIMER START SET Button
12. TIMER STOP SET Button
13. TIMER Button
14. TIMER Light
15. VIDEO Button
16. VIDEO Light
17. TV Button
18. TV Light
19. S WIDE Button (Sound Wide)
20. S WIDE Light (Sound Wide)
21. PRESET/NORMAL Switch
22. SHARPNESS Control Knob
23. B-LEVEL Control Knob
24. PICTURE Control Knob
25. COLOR Control Knob
26. TINT Control Knob
27. V-HOLD Control Knob
28. AUTO COLOR Button
29. AUTO COLOR Light
30. BALANCE Control Knob
31. TREBLE Control Knob
32. BASS Control Knob
33. HEADPHONE Jack
34. EARPHONE Jack
35. VIDEO 2 Connectors
36. MONITOR Connectors
37. Infrared Sensor Window

REAR PANEL

38. VHF Antenna Connectors (75 ohms)
    ANT INPUT
    CONVERTER OUTPUT
    AUX INPUT
39. UHF Antenna Connectors (300 ohms)
40. VACATION SWITCH
41. VIDEO 1 IN Connectors
42. VIDEO 1 OUT Connectors
43. LEVEL Control Knob
44. MONITOR Connectors
45. TV Connectors
46. TV MULTIPLEX AUDIO Terminal
47. 3.58 TRAP Switch
48. EXT. SPEAKER Connectors
49. SPEAKER SELECT Switch

REMOTE CONTROL UNIT



REMOTE CONTROL UNIT

1. Power ON/OFF
2. ANT/AUX Button
3. CH/TIME Button
4. Sound Volume Buttons
5. Sound Mute Button
6. CH. Up/Down Buttons
7. Channel Number Keys

CHANNEL NUMBER INDICATION vs. RECEIVING CHANNEL

This table indicates the relationships between the channel number indication of monitor unit and the VHF, CATV/STD and CATV/HRC frequency receptions.
The reception values indicated on the table are the Picture Carrier Frequencies, so the Sound Carrier Frequency and Local Oscillation Frequency of each channel are easily calculated with the expressions shown below:

fS = fP + 4.5 MHz
fL = fP + 45.75 MHz
fP: Picture Carrier Frequency
fS: Sound Carrier Frequency
fL: Local Oscillation Frequency

* US & CANADA SYSTEM: M
PICTURE IF = 45.75 MHz

CHANNEL NUMBER INDICATION	MODE		
	AIR	CATV (STD)	CATV (HRC)
	Freq.(MHz)	Freq.(MHz)	Freq.(MHz)
02	55.25	55.25	54.00
03	61.25	61.25	60.00
04	67.25	67.25	66.00
05	77.25	77.25	78.00
06	83.25	83.25	84.00
07	175.25	175.25	174.00
08	181.25	181.25	180.00
09	187.25	187.25	186.00
10	193.25	193.25	192.00
11	199.25	199.25	198.00
12	205.25	205.25	204.00
13	211.25	211.25	210.00
14	471.25	121.25	120.00
15	477.25	127.25	126.00
16	483.25	133.25	132.00
17	489.25	139.25	138.00
18	495.25	145.25	144.00
19	501.25	151.25	150.00
20	507.25	157.25	156.00
21	513.25	163.25	162.00
22	519.25	169.25	168.00
23	525.25	217.25	216.00
24	531.25	223.25	222.00
25	537.25	229.25	228.00
26	543.25	235.25	234.00
27	549.25	241.25	240.00
28	555.25	247.25	246.00
29	561.25	253.25	252.00
30	567.25	259.25	258.00
31	573.25	265.25	264.00
32	579.25	271.25	270.00
33	585.25	277.25	276.00
34	591.25	283.25	282.00
35	597.25	289.25	288.00
36	603.25	295.25	294.00
37	609.25	301.25	300.00
38	615.25	307.25	306.00
39	621.25	313.25	312.00
40	627.25	319.25	318.00
41	633.25	325.25	324.00
42	639.25	331.25	330.00

CHANNEL NUMBER INDICATION	MODE		
	AIR	CATV (STD)	CATV (HRC)
	Freq.(MHz)	Freq.(MHz)	Freq.(MHz)
43	645.25	337.25	336.00
44	651.25	343.25	342.00
45	657.25	349.25	348.00
46	663.25	355.25	354.00
47	669.25	361.25	360.00
48	675.25	367.25	366.00
49	681.25	373.25	372.00
50	687.25	379.25	378.00
51	693.25	385.25	384.00
52	699.25	391.25	390.00
53	705.25	397.25	396.00
54	711.25	403.25	402.00
55	717.25	409.25	408.00
56	723.25	415.25	414.00
57	729.25	421.25	420.00
58	735.25	427.25	426.00
59	741.25	433.25	432.00
60	747.25	91.25	90.00
61	753.25	97.25	96.00
62	759.25	103.25	102.00
63	765.25	109.25	108.00
64	771.25	115.25	114.00
65	777.25	73.25	72.00
66	783.25		
67	789.25		
68	795.25		
69	801.25		
70	807.25		
71	813.25		
72	819.25		
73	825.25		
74	831.25		
75	837.25		
76	843.25		
77	849.25		
78	855.25		
79	861.25		
80	867.25		
81	873.25		
82	879.25		
83	885.25		

MECHANICAL DISASSEMBLY

1. BACK COVER REMOVAL
(1) Remove 6 or 7 Back-cover mounting screws Ⓐ.
(2) Remove 6 Rear-panel mounting screws Ⓑ.
(3) Remove the Back-cover.

2. CHASSIS SERVICE POSITION
2.1. Main Chassis Removal
(1) Remove 4 Main-chassis mounting screws Ⓒ.
(2) Slide back the Main-chassis.

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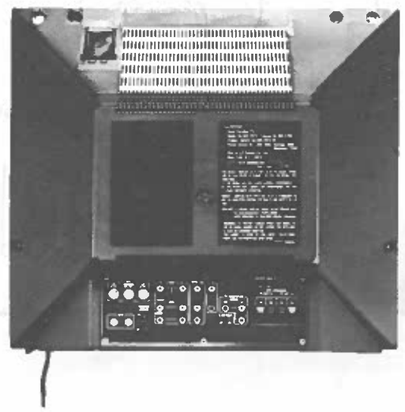

2.2. Rear Panel Removal
(1) Remove 3 Rear-panel mounting screws Ⓓ.
(2) Remove the Rear-panel.

2.3. Assy-Speaker Removal
(1) Remove Bracket in the direction of the arrow ①.
(2) Remove the Assy-speaker ②.

2.4. Assy-DC-Power Supply
(1) Spread out the ends of Guide Rail ①.
(2) Pull out the Assy-DC-power supply ②.

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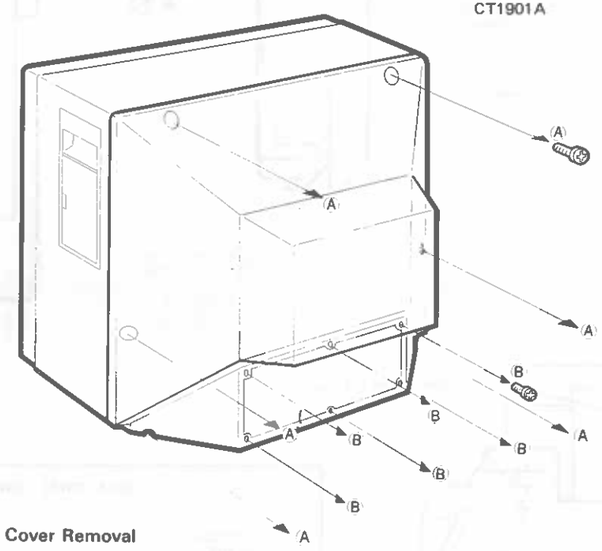
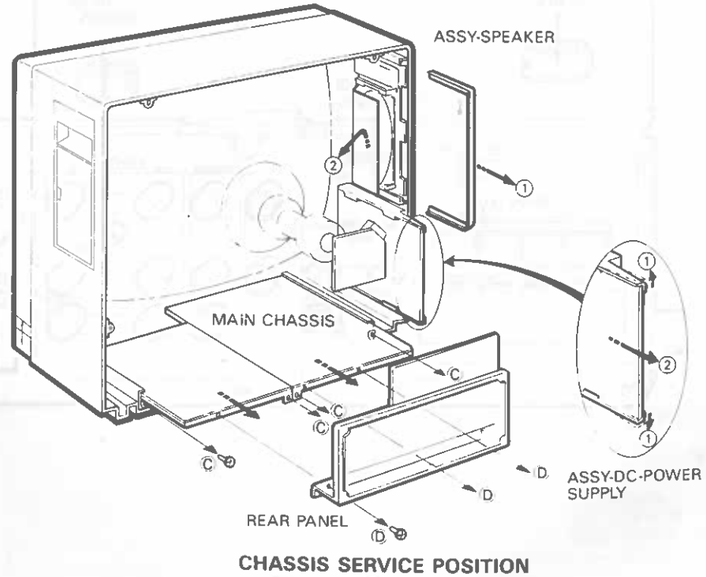
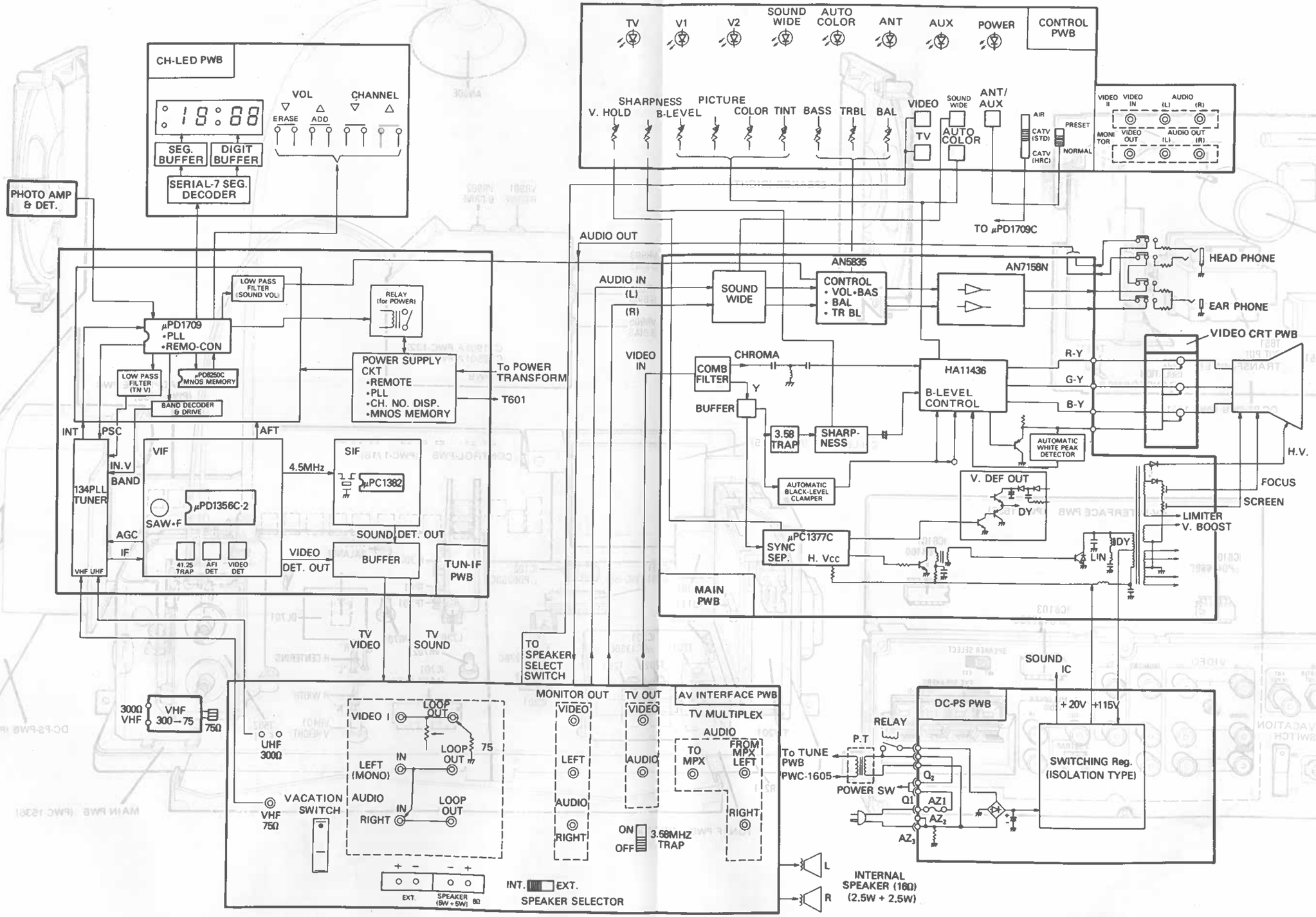


Back Cover Removal

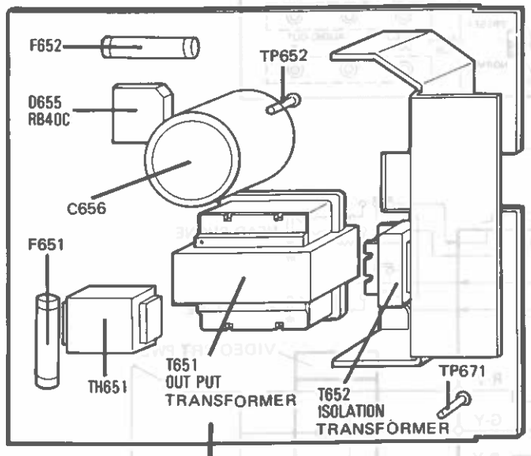


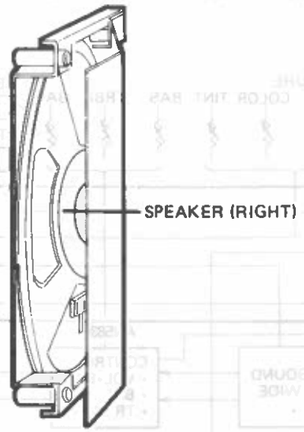
CHASSIS SERVICE POSITION

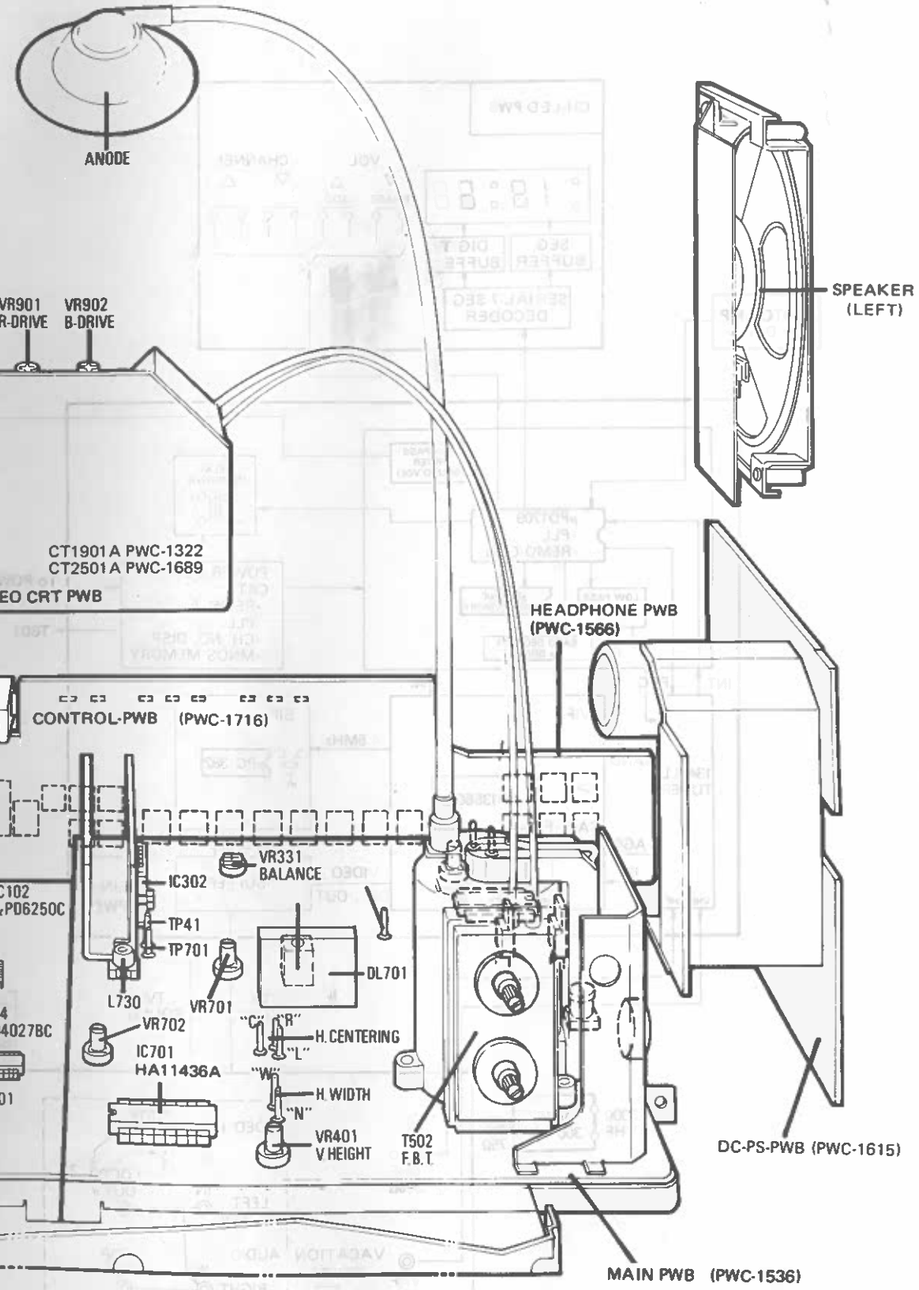
BLOCK DIAGRAM

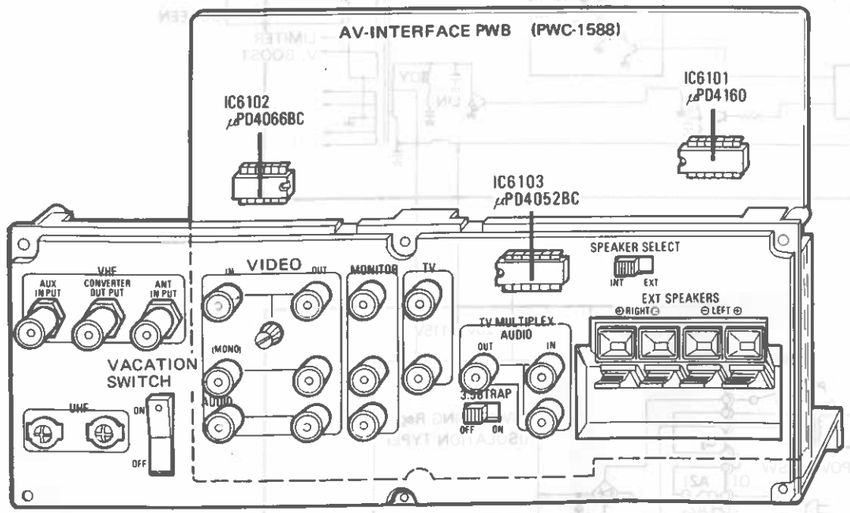


PARTS LOCATION DIAGRAM









2.4. RF AGC Adjustment (VR201)

(1) Feed a standard color bar signal of 60 dBμ (75 Ω load).
(2) Connect a DC voltmeter to terminal No. 2 (AGC) of the tuner on the TUN-IF PWB (or TP205).
(3) Adjust the RF AGC VR (VR201) to obtain a 7.0 V DC reading on the voltmeter.
(4) Increase the input level to 63 dBμ, and check that the reading on the voltmeter decreases by approx. 1.5 V DC.
(5) Decrease the input level below 60 dBμ (or cut-off the input signal) and check that the reading rises by +0.3 V or more from the 7 V DC.

3. PICTURE

3.1. White Balance Adjustment

Note: Allow 12 minutes warm-up time before adjustment.

(1) Feed a B/W signal and set the B-LEVEL and PICTURE controls to their minimum positions.
(2) Set the BIAS VRs (R, G & B) and DRIVE VRs (R & B) to their mechanical center positions.
(3) Set the CRT SCREEN control fully counterclockwise.
(4) Clamp the SERVICE TP on the main PWB to 12 V through an external resistor (1 KΩ or so). (A horizontal line will appear on the screen).
(5) Adjust the SUB BRIGHT VR (VR702) to obtain 165 V DC at the G-cathode of the CRT.
(6) Turn the CRT SCREEN control clockwise until the first colored horizontal line is barely visible on the screen.
(7) Turn the associated BIAS VR of the color which appears fully counterclockwise.
(8) Turn the CRT SCREEN control to produce a barely visible horizontal line of another color on the screen. Turn the associated BIAS VR fully counterclockwise.
(9) Again adjust the CRT SCREEN control to produce the barely visible horizontal line of the remaining color. But leave the associated BIAS VR at its mechanical center.
(10) Turn the other two BIAS VRs clockwise to adjust the white balance of CRT cut-off.
(11) If the last color does not appear with the SCREEN control at maximum in step (9), turn the associated BIAS VR by 45° clockwise and repeat steps (6) through (9).
(12) Remove the resistor from the SERVICE TP.
(13) Set the B-LEVEL and PICTURE controls to their maximum positions.
Adjust the white balance with DRIVE VRs R and B.
(14) With varying the B-LEVEL and PICTURE controls, check tracking of the white balance. Repeat steps (3) through (13) if necessary.

Note: When readjustment of the CRT cut-off is made, the G-cathode voltage should be 165 V DC.

3.2. 3.58 MHz Trap Adjustment (L703)

(1) Feed a color bar signal.
(2) Connect an oscilloscope to TP701. Set the oscilloscope to 0.5 V/div.
(3) Set the 3.58 MHz TRAP switch (S6103) on the AV interface PWB to the ON position.
(4) Adjust L703 on the main PWB to minimize the chrominance element included in the video signal.

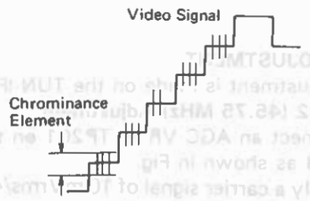


Fig. 3

3.3. Comb Filter Adjustment (T701/VR701)

(1) After completion of the "3.58-MHz Trap Adjustment " in 3-2, set the 3.58-MHz TRAP switch to the OFF position.
(2) Connect an oscilloscope to TP701 in the same manner as in item 3-2.
(3) Adjust T701 and VR701 on the main PWB alternately to minimize the chrominance element included in the video signal.

4. SUB B-LEVEL ADJUSTMENT (VR702)

(1) Feed a standard NTSC color bar signal of 5% black level set up.
(2) Adjust the SUB B-LEVEL VR (VR702) on the main PWB so that the black portion on the picture becomes black.

5. HORIZONTAL AND VERTICAL SYNCHRONIZATION

5.1. Horizontal Synchronization (VR501)

(1) Feed a test pattern signal.
(2) Clamp the TP31 to 12 V via a resistor (a few hundred ohms).
(3) Adjust the H. HOLD VR (VR501) to obtain a horizontally synchronized picture.
(4) Remove the resistor and check that synchronization is maintained.

5.2. Horizontal Positioning

(1) Adjust the center of picture in the correct position by selecting the horizontal centering clip on the main PWB.
Centering clip is selectable among N, R and L.

5.3. Vertical Synchronization

(1) Feed a test pattern signal.
(2) Adjust the V. HOLD control to obtain a vertically synchronized picture.

5.4. Vertical Height Adjustment (VR401)

(1) Feed a test pattern signal.
(2) Adjust the V. HEIGHT VR (VR401) so that the outer circle of the pattern is correctly shaped.

5.5. Vertical Positioning

(1) When the vertical center deviates from the CRT geometric center by 3 mm or more, correct it by switching the V. CENTERING switch (S401). (up or down)
(2) Repeat item 5-4 and readjust the vertical height.

6. HIGH VOLTAGE

6.1. Checking CRT Anode Voltage

(1) Tune a color bar pattern from a color bar generator. Check that +B2 is 115 V DC.
(2) Set the B-LEVEL and PICTURE controls to their minimum positions, and check that the CRT anode voltage is 27.0 KV ± 1 KV.

6.2. Checking High Voltage Protector Circuit

(1) Tune a color bar pattern from a color bar generator, and set the B-LEVEL and PICTURE control to their minimum positions. Verify +B2 is 115 V DC.
(2) Connect a resistor (a few hundred ohms) across the base of TR654 and TP652 (– 26 V) on the DC-PS PWB.
Check that the high voltage protector operates and picture and sound disappear.
The high voltage which will operate the high voltage protector should be less than 33.15 KV.
(3) Switch off the VACATION switch on the rear panel.
After 10 seconds, switch on the VACATION switch and then turn the Power ON and check that the equipment operates properly.

6.3. High Voltage Protector Adjustment

Do not attempt to adjust the high voltage protector circuit. This adjustment must be performed at the factory.

7. SOUND OUTPUT ADJUSTMENT (BALANCE)

(1) Supply 400 Hz to the left channel audio input jack at video 1.
(2) Set the controls and switch as follows:
TV/VIDEO 1/VIDEO 2—VIDEO 1
BALANCE—mechanical center
BASS—mechanical center
TREBLE—mechanical center
SPEAKER SELECT—EXT
(3) Connect dummy loads or speakers of 8 Ω/10 W to the EXT SPEAKERS terminals (L and R channels).
(4) Connect an AC voltmeter with RMS measure across the R-channel dummy load.
Set the VOLUME to obtain 2 Vrms ± 0.2 V (0.5 W) on the voltmeter.
(5) Connect the AC voltmeter across the L-channel dummy load, and then adjust VR331 to obtain the same reading as in step (4)

8. PURITY AND CONVERGENCE ADJUSTMENT

Note: Allow 12 minutes minimum warm-up time.

8.1. Purity Adjustment

(1) De-gauss CRT.
(2) Feed a monoscope pattern signal.
(3) Check whether the static magnets are fixed in the correct positions as shown in Fig. 4 and (a) purity magnet, (b) 4-pole magnet and (c) 6-pole magnet fingers are at the positions indicated in Fig. 5.
Note: When the 4-pole and 6-pole magnet fingers are lined up correctly, the magnet field is "zero" and R.G.B static convergence should be close. If off, perform rough convergence adjustment before proceeding to the later adjustment.
(4) Disconnect "G-Y" tip to provide magenta color (R & B).
(5) Loosen the deflection yoke set screw and pull the yoke backward.
(6) Spread out the fingers of the purity magnets for the same angle from their original horizontal positions until a magenta vertical stripe appears in the center of the screen.
(7) By visually watching screen, move the deflection yoke forward until optimum purity position reached, then tighten deflection yoke set screw lightly and if the deflection yoke tends to bow down, insert a spare wedge from top of the yoke flare mouth.
(8) Re-connect "G-Y" tip and check for even white screen. If even white color is not obtained, repeat steps (4) to (8).
(9) Apply + 12 V to the SERVICE TP via a resistor (a few hundred ohms) to provide horizontal stripe on the screen.
If the horizontal stripe is tilted, rotate the deflection yoke to correct the tilt.
(10) Remove the resistor from the SERVICE TP and confirm entire screen area purity.
(11) If necessary, repeat steps (4) to (10).
(12) Tighten the deflection yoke set screw at 12.1 in-lb torque.
(13) After completing the purity adjustment, adjust CRT focus to optimum condition.
Adjust focus on the monoscope pattern with maximum contrast and brightness to obtain optimum focus at third and fourth contrast chart zone. Refer to Fig. 6.

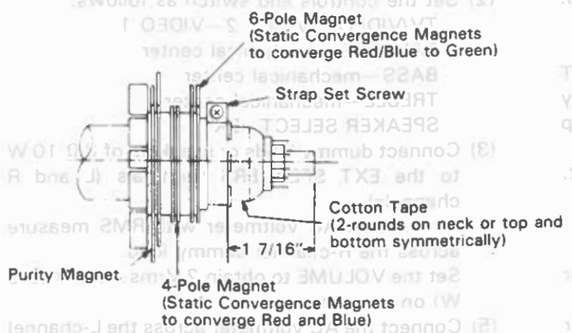


Fig. 4 Static Magnets

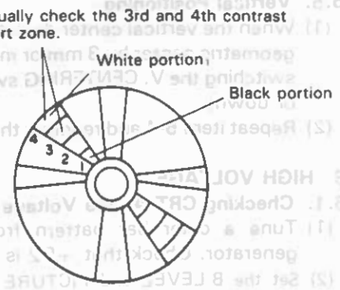


Fig. 6

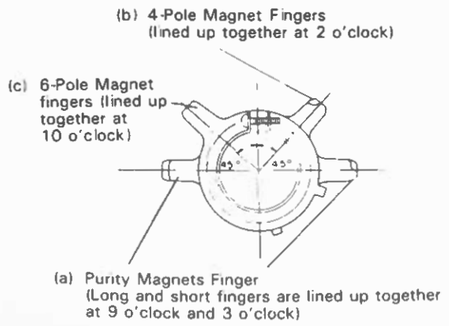

(b) 4-Pole Magnet Fingers
(lined up together at 2 o'clock)
(c) 6-Pole Magnet
fingers (lined up
together at
10 o'clock)
(a) Purity Magnets Finger
(Long and short fingers are lined up together
at 9 o'clock and 3 o'clock)

Fig. 5 Static Magnet Positions
(Viewed from Rear of CRT)

8.2. Static Convergence Adjustment

(1) Feed a crosshatch pattern signal and adjust the B-LEVEL and PICTURE controls to minimize black portion of the pattern.
(2) Disconnect "G-Y" tip to provide only red and blue on the screen.
(3) Spread out the two fingers of the 4-pole magnets until the red and blue vertical stripes are converged in the center of the screen. (Refer to Fig. 7.)
If the stripes are not converged, finely change the angle of the fingers.
(4) Next, with the same fingers spread, rotate the two fingers of the 4-pole magnets together until the red and blue horizontal stripes are converged in the center of the screen. (Refer to Fig. 7.)
If this operation misconverges vertical stripes, touch up preadjusted fingers angle to correct it.
(5) Re-connect "G-Y" tip to provide red, green and blue on the screen.
(6) Spread out the two fingers of the 6-pole magnets until the red/blue and green vertical stripes are converged in the center of the screen. (Refer to Fig. 9).
(7) Next, with the same fingers spread, rotate the two fingers of the 6-pole magnets together until the red/blue and green horizontal stripes are converged in the center of the screen. (Refer to Fig. 7.)
If this operation misconverges vertical stripes, touch up preadjusted fingers angle to correct it.
(8) After completion of the above adjustments, red, blue and green should be converged in the center of the screen.
If not, repeat steps (3) to (7).

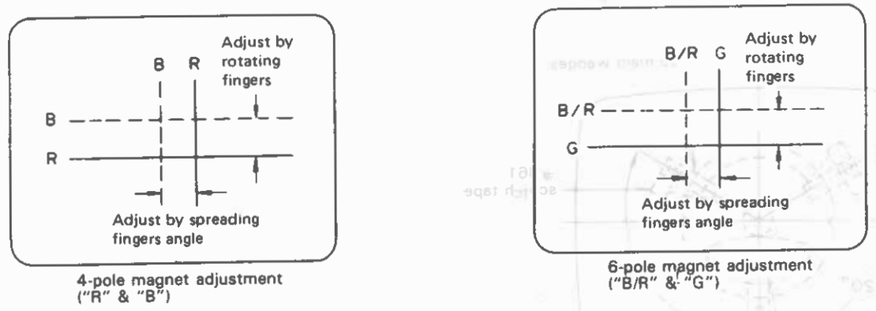
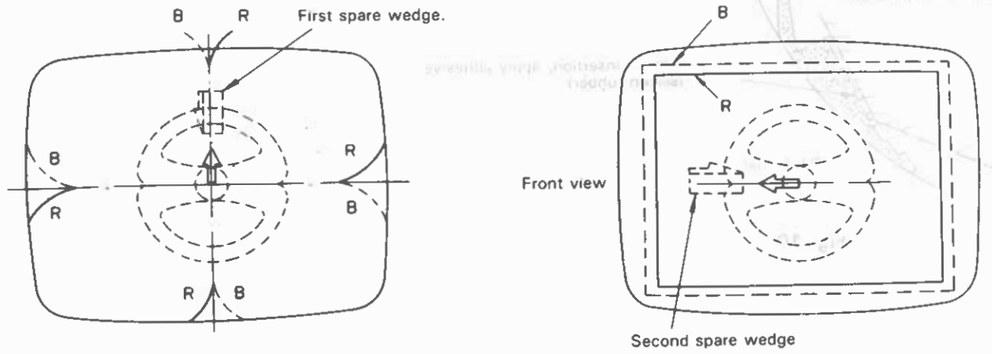


Fig. 7 Static Convergence Adjsutment

8.3. Dynamic Convergence Adjustment

Note: Wedges should be fixed with 120° intervals.
(1) Insert first spare wedge directly on top of the deflection yoke flare to minimize misconvergences of red and blue vertical stripes at the top and bottom center and also red and blue horizontal stripes at the right and left center of the screen. (Refer to Fig. 8).



If "B" is outside "R", insert a wedge at the 3 o'clock position (viewed from the rear), and if inside, insert it at 9 o'clock position.

Fig. 8 Dynamic Convergence Adjustment

(2) If the blue at the outer extremities of the screen is now outside the red as shown in Fig. 9, insert the second spare wedge at the 3 o'clock position (viewed from the rear) and adjust the angle of the yoke for best convergence.
If the blue at the outer extremities of the screen is inside the red, insert the second spare wedge at the 9 o'clock position (viewed from the rear) and adjust the angle of the yoke for best convergence.

(3) Insert the main wedge at the 6 o'clock position and insert second and third main wedges at the 10 o'clock and 2 o'clock positions, then remove the spare wedges.
Note: Insertion of the main wedges and removal of the spare wedges should be made carefully so as not to lose the convergences thus obtained.

(4) Confirm entire screen area convergence.

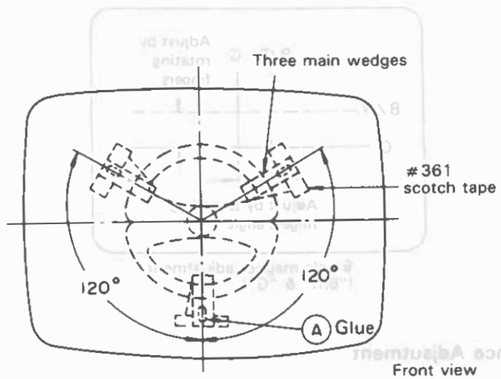


Fig. 9 Deflection Yoke Fixing Method

8.4. Method of fixing Deflection Yoke

(1) Before inserting the main wedges, apply No. 3145 RTV silicon rubber to the place which will contact with the deflection yoke coil. (Refer to Fig. 10.)

(2) Insertion pressure of wedges should be more than 10 kg.

(3) Apply adhesive (No. 3145 RTV silicon rubber) between wedge and CRT funnel (refer to Fig. 9 (A) and Fig. 10) and then use scotch tape No. 361 to cover any open spaces.

(4) Apply paint lock to the static magnets and the deflection yoke set screw.

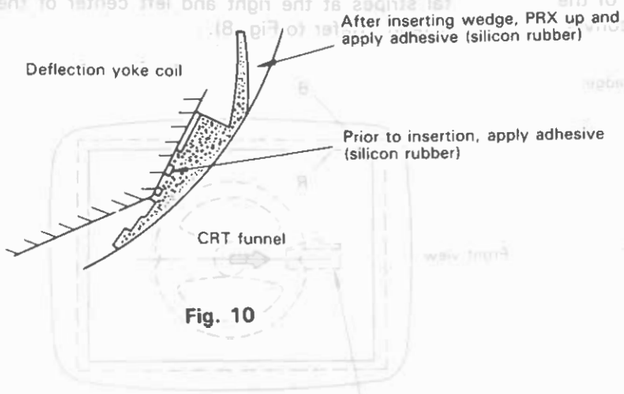

After inserting wedge, PRX up and apply adhesive (silicon rubber)
Deflection yoke coil
Prior to insertion, apply adhesive (silicon rubber)
CRT funnel

Fig. 10

CIRCUIT DESCRIPTIONS

POWER SUPPLY CIRCUIT

The power supply circuit is of the hot-chassis type. The switching regulator is of the isolation type which separates the discharge from the charge portion of the circuitry.
This circuit provides highly stabilized 115 V DC. The input AC voltage is rectified and converted into a 15.75 kHz AC signal, then filtered to a DC voltage.

1. Basic Theory of Switching Regulator

Input DC voltage applied to the primary winding of the transformer is choppered by switch, SW.
Electromagnetic energy stored in the primary winding during the ON position is induced into the secondary winding during the OFF position. The output is then rectified by a diode.
Assuming that current flowing in the primary of the transformer during SW ON is to be "i1", then:

$i1 = V1/L1$ L1: Transformer primary winding inductance

Electromagnetic energy "EL" stored during this period will be;

$$EL = 1/2 \times L1 \times i1^2$$

This energy is to be induced in to the secondary during SW OFF, and therefore assuming that electricity consumption at the secondary is W, then;

$$W = 1/2 \times 1/T \times L1 \times i1^2$$

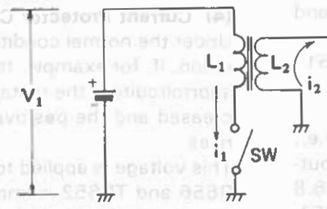
T = SW ON/OFF period

The secondary output voltage V2 will be;

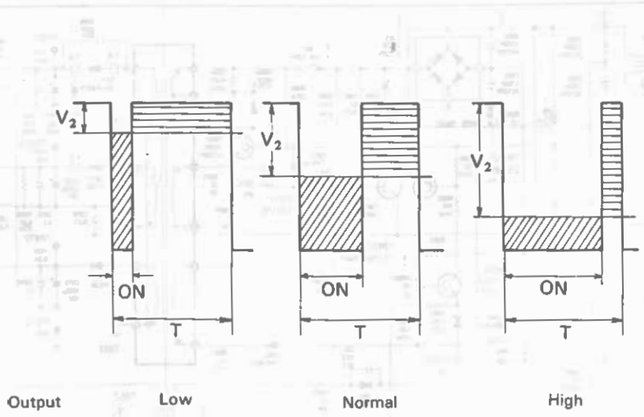
$$V2 \times OFF/T = ON/T \times V1 \times N2/N1$$

$$V2 = \frac{ON}{T-ON} \times V1 \times N2/N1$$

Therefore, the output voltage can be controlled by keeping T at a constant rate and changing the ON period.



Basic Circuit



Output Voltage

2. Circuit Operation

Figure shows the diagram of the power supply circuit. The circuit consists of power regulator (TR651), pulse width controller (TR653), error amplifier (TR654), current protector (TR652), switching transformer (T651) and their peripheral circuits.

(1) Starter Circuit

AC line voltage is rectified by a full-wave rectifier D655 and filtered by C656. Thus, 160 V DC voltage is supplied to the base and collector of power regulator TR651 through fuse F652 (2A).
R665, C655, R655 and L2 compose a starter circuit and the base of TR651 is biased through this circuit.
When the power is turned ON, rectified 160 V DC is applied to the base of TR651 through R665. This turns on TR651 and current flows into the primary side of the switching transformer T651.
When the base current reaches a certain amount and TR651 is saturated, TR651 is turned to cut-off and the current flow of the primary side of T651 is also cut off. As a result, electromagnetic energy of the secondary side coil is output to the 115 V DC line on the main PWB via terminal Q1.
This DC power supply activates the horizontal deflection circuit and the FBT produces a pulse.
The output pulse from the secondary side of FBT is fed back to the base of TR651 via terminal Q2 and inverter transformer T652.
This pulse will control the ON/OFF time of TR651.

(2) Error Amplifier (TR654)

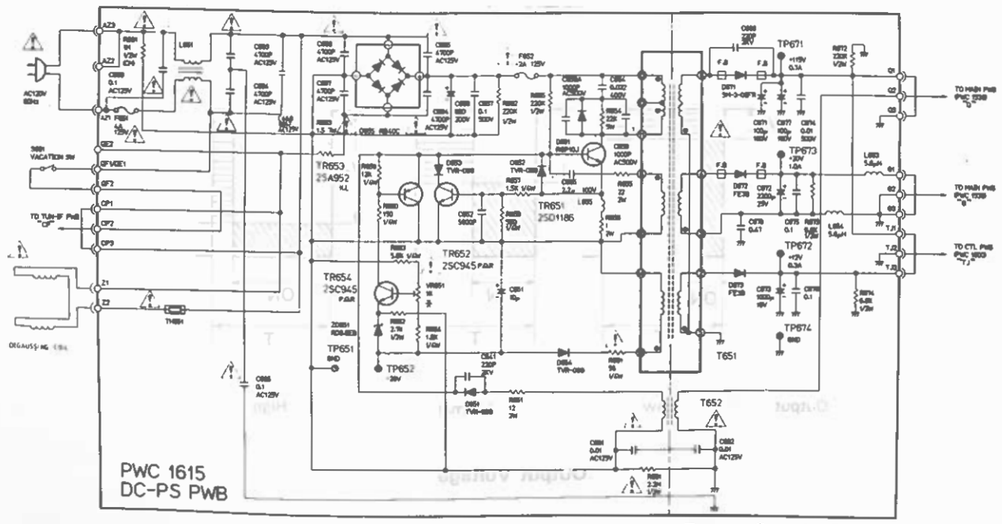
TR654 detects the change in output DC voltage, i.e., error voltage, via L3 to maintain a stabilized DC output voltage. The emitter of TR654 is clamped to 6.8 V by zener diode ZD651. While, to the base of TR654, the electromagnetic energy of coil L3 is applied through R654 and VR651. Coil L3 acts to detect the DC output voltage.
The error output is applied from the collector of TR654 to the base of the pulse width controller TR653.
The base voltage of TR653 varies with the error amount, and the ON/OFF interval time of the power regulator TR651 is also changed.
When the DC output voltage increases, pulse width which controls ON/OFF of the TR651 is reduced to lower the DC output voltage.

(3) Pulse Width Control Circuit (TR653)

The current flow to the switching transformer T651 is changed by controlling the base voltage of the power regulator TR651.
This is done by controlling the ON/OFF interval time of TR651 by means of the pulse width control circuit.
The base of TR653 is connected to the output of the error amplifier TR654 and the collector is connected to the ground line through clamping capacitor C651.
When the pulse from FBT is applied to the emitter of TR653, TR653 turns ON in terms of the error amount produced by the error amplifier TR654.
A change in the ON interval of TR653 will cause a change in the base voltage of power regulator TR651.
As a result, current flow to the switching transformer is changed to maintain the DC output voltage constant.

(4) Current Protector Circuit (TR652)

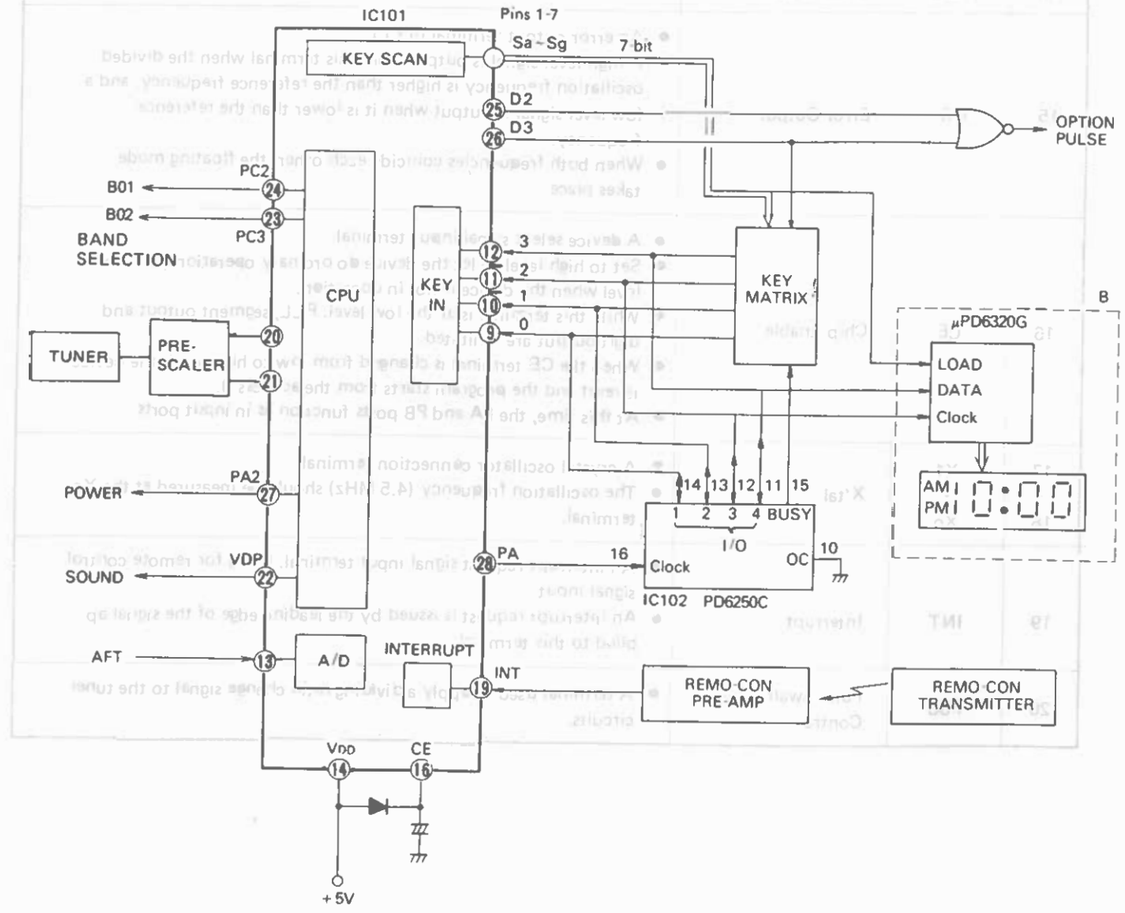
Under the normal condition, TR652 is in cut-off condition. If, for example, the secondary side of T651 is shortcircuited, the voltage produced at coil L3 is increased and the positive voltage at pin 14 of T651 rises.
This voltage is applied to the base of TR652 through R656 and TR652 is immediately turned ON.
As a result, D653 is turned ON and the base voltage of TR651 is pulled to ground through D653 and TR652, resulting in shutting down all circuits.



Power Supply Circuit

TUNING CIRCUIT

IC101 (μPD1709C) on the TUN-IF PWB is a digital tuning 4-bit C-MOS micro-processor with PLL and controller in one chip.
This IC controls each control switch operation, Channel display, signals between tuner and signals from the remote control receiver.
KEY IN (pins 9–12) of IC101 is the bidirectional port and KEY SCAN (pins 1–7) is the output port. Each control switch in the key-matrix circuit is connected between the KEY IN and KEY SCAN terminals. The state of a switch is scanned by the scanning signal from the KEY SCAN terminal and is input at KEY IN terminal.
For example, when the Entry button is pressed, the CPU interprets that the Entry button is now pressed by comparing the scanning pulse timing and the data obtained at KEY IN terminal.
At the time, from the CPU, tuning pre-scaler signal and band signals are fed to the tuning circuit via pin 20 and pins 23 and 24.
The output from the remote control receiver is applied to the INTERRUPT input of IC101 and then decoded and processed by the CPU.
Channel display is controlled by IC101 through KEY SCAN terminals for controlling display elements Sa-Sg and D2 and D3 terminals for controlling digit changeover.



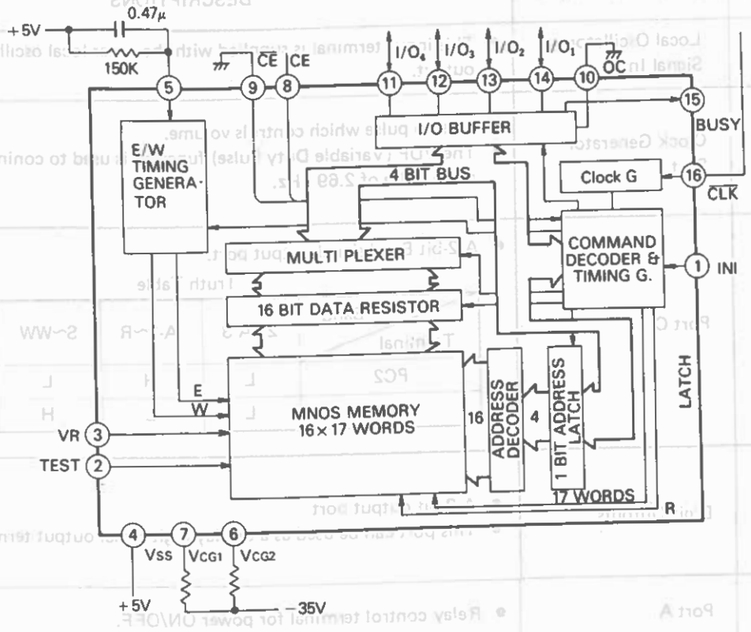
Block Diagram of Micro-processor Circuit

μPD-1709C IC101

PIN NO.	SYMBOL	TERMINAL NAME	DESCRIPTIONS
1 ~ 7	Sa ~ Sg	Segment Output (Key return)	• An output terminal for display of segment signals. • These terminals can also be used as key return sources of the key matrix.
8	GND	Ground	• The device ground terminal.
9 ~ 12	PB0 ~ PB3	Port B	• A 4-bit input/output port. (Key in & Data I/O for EAROM)
13	A/D	Analog/Digital Input	• An A/D (Analog/Digital) converter input terminal for digital AFT. • As an A/D converter, a 4-bit A/D converter of the program sequential comparing system is provided.
14	VDD	Power Supply	• A device power supply terminal.
15	EO	Error Output	• An error output terminal of PLL. • A high level signal is output from this terminal when the divided oscillation frequency is higher than the reference frequency, and a low level signal is output when it is lower than the reference frequency. • When both frequencies coincide each other, the floating mode takes place.
16	CE	Chip Enable	• A device select signal input terminal. • Set to high level to let the device do ordinary operations, and low level when the device is not in operation. • While this terminal is at the low level, PLL, segment output and digit output are inhibited. • When the CE terminal is changed from low to high level, the device is reset and the program starts from the address 0. • At this time, the PA and PB ports function as in input ports.
17 · 18	X1 · Xo	X'tal	• A crystal oscillator connection terminal. • The oscillation frequency (4.5 MHz) should be measured at the Xo terminal.
19	INT	Interrupt	• An interrupt request signal input terminal. Using for remote control signal input. • An interrupt request is issued by the leading edge of the signal applied to this terminal.
20	PSC	Pulse Swallowing Control	• A terminal used to apply a dividing ratio change signal to the tuner circuits.

μPD-1709C IC101 (Continued)

PIN NO.	SYMBOL	TERMINAL NAME	DESCRIPTIONS
21	IN	Local Oscillator Signal Input	• This input terminal is supplied with the tuner local oscillator output.
22	CGP	Clock Generator Port	• 64 step pulse which controls volume. • The VDP (Variable Duty Pulse) function is used to coninuously output a pulse of 2.69 kHz.
23 · 24	PC2 · PC3	Port C	• A 2-bit Band signal output port. Truth Table Band / Terminal: 2~A-3 / A-2~R / S~WW / 14~83 PC2: L / H / L / H PC3: L / L / H / H
25 · 26	D2 · D3	Digit Outputs	• A 2-bit output port. • This port can be used as a display digit signal output terminal.
27	PA2	Port A	• Relay control terminal for power ON/OFF.
28	PA3	Port A	• Clock pulse output terminal for EAROM.



μPD6250C Block Diagram (EAROM) IC102

μPD-6250C IC102

PIN NO.	SYMBOL	TERMINAL NAME	DESCRIPTIONS
1	INT	Initial Input	———
2	TEST	Test Input	———
3	VR	Test Input	———
4	Vss	Sub-Voltage Terminal	• A sub-voltage terminal of IC.
5	OSC	Oscillation Terminal	• An oscillation terminal to make the time for writing and erasing. • By externally mounting CR, it oscillates 2 clocks at the end of "DW" and "AW".
6	VGG2	Power Supply Voltage Terminal	• A power supply terminal of -25 V to be applied to the memory.
7	VGG1	Power Supply Voltage Terminal	• A power supply terminal of -12 V to be applied to the memory peripheral section.
8	CE	Chip Enable input	• An input terminal for IC selection.
9	$\overline{CE}$	Chip Enable Input	• An input terminal for IC selection.
10	OC	Output Common Terminal	• An output common terminal of I/01 ~ I/04 and BUSY output terminal.
11 ~ 14	I/01 ~ I/04	Input/Output Terminals	• Input/Output terminals of commanded, address and data bus. • This IC uses four buses I/01 ~ I/04 to control four kinds of instructions, 16-word memory address data and 16-bit data input/output. • After reading the first instruction, it controls internal reading in synchronization with the clock and the output timing within the IC.
15	BUSY	Busy Output	• An output to display the IC operating state. • It displays the IC operation during execution of instruction and E/W. • The memory operating state can be tested by the controller.

μPD-6250C IC102 (Continued)

PIN NO.	SYMBOL	TERMINAL NAME	DESCRIPTIONS
16	CLK	Clock Input	• A clock input terminal of IC. • It reads the instruction of the I/O bus and latches in the clock Low period. • If the latched data is the following four instructions, Data read, Data write, Address read and Address write at that time, a series of operation is started by the succeeding clock.

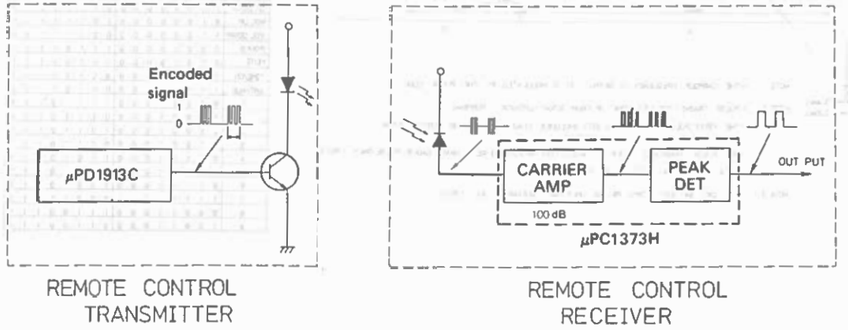
Table of Command

INI	CE	$\overline{CE}$	I/01	I/02	I/03	I/04	OPERATION
L	H	L	X	X	L	L	NO Select
L	H	L	L	L	H	L	DR (Data Read)
L	H	L	H	L	H	L	DW (Data Write)
L	H	L	L	H	H	L	AR (Address Read)
L	H	L	H	H	H	L	AW (Address Write)
H	X	X	X	X	X	X	Internal Reset

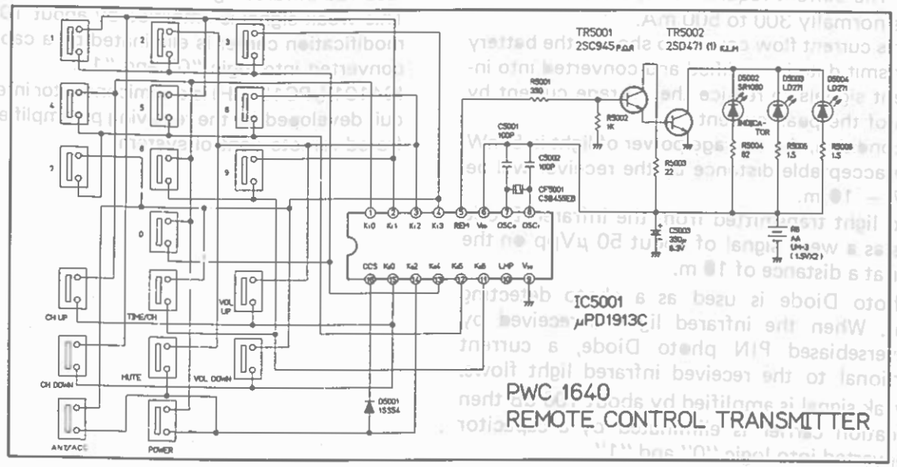
REMOTE CONTROL TRANSMITTER

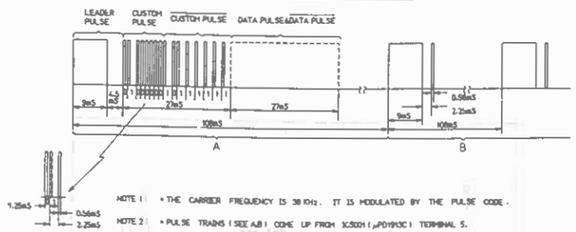
Transmit data is composed of intermittent infrared signals. The current required to operate an infrared Diode is normally 300 to 500 mA.
Since this current flow causes to shorten the battery life, transmit data is modified and converted into intermittent signals to reduce the average current by one ten of the peak current.
In this condition, the average power of light is 5 mW and the acceptable distance by the receiver will be about 7 – 10 m.
Infrared light transmitted from the infrared Diode appears as a weak signal of about 50 μVpp on the receiver at a distance of 10 m.
PIN photo Diode is used as a photo detecting element. When the infrared light is received by the reversebiased PIN photo Diode, a current proportional to the received infrared light flows.
This weak signal is amplified by about 100 dB then modification carrier is eliminated by a capacitor and converted into logic "0" and "1".

PIN photo LED is used as a photo detecting element. When the infrared light is received by the reverse-biased PIN photo LED, a current proportional to the received infrared light flows.
This weak signal is amplified by about 100 dB then modification carrier is eliminated by a capacitor and converted into logic "0" and "1".
IC4101 (μPC1373H) is a semiconductor integrated circuit developed for the receiving preamplifier of the infrared remote control system.



Basic Block Diagram





NOTE 1 : • THE CARRIER FREQUENCY IS 38 KHz. IT IS MODULATED BY THE PULSE CODE.

NOTE 2 : • PULSE TRAINS (SEE A,B) COME UP FROM IC5001 (μPD1913C) TERMINAL 5.
• THE FIRST PULSE TRAIN OF 32 BITS INCLUDES LEADER PULSE AND CUSTOM PULSE. CUSTOM PULSE, DATA PULSE, DATA PULSE (SEE A).
• 2ND PULSE TRAIN AND AFTER IT (WHILE KEEP ON PUSHING KEY) HAVE LEADER PULSE ONLY (SEE B)
• DATA PULSE CODE, DATA PULSE CODE : SEE TABLE 1

NOTE 3 : • USE DRY BATTERY. TYPE R6, AA, LM-3, OR EQUIVARENT X2 (1.5VX2).

TABLE 1

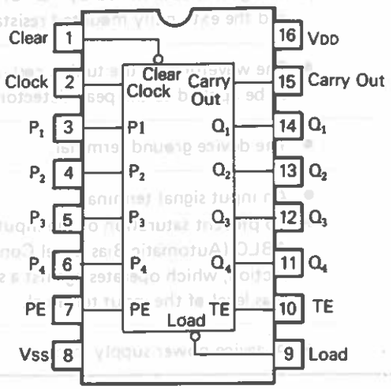
KEY \ CODE	DATA PULSE								DATA PULSE							
CH UP	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
CH DOWN	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
VOL UP	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1
VOL DOWN	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
POWER	0	0	0	1	0	0	0	0	1	1	1	0	1	1	1	1
MUTE	0	1	0	1	0	0	0	0	1	0	1	0	1	1	1	1
TIME/CH	1	1	0	1	1	0	0	0	0	0	1	0	1	1	1	1
ANT/AUX	1	1	0	1	0	0	0	0	0	0	1	0	1	1	1	1
0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1
1	1	0	0	0	1	0	0	0	0	1	1	1	0	1	1	1
2	0	1	0	0	1	0	0	0	1	0	1	1	0	1	1	1
3	1	1	0	0	1	0	0	0	0	0	1	1	0	1	1	1
4	0	0	1	0	1	0	0	0	1	1	0	1	0	1	1	1
5	1	0	1	0	1	0	0	0	0	1	0	1	0	1	1	1
6	0	1	1	0	1	0	0	0	1	0	0	1	0	1	1	1
7	1	1	1	0	1	0	0	0	0	0	0	1	0	1	1	1
8	0	0	0	1	1	0	0	0	1	1	1	0	0	1	1	1
9	1	0	0	1	1	0	0	0	0	1	1	0	0	1	1	1

μPC-1373H

PIN NO.	SYMBOL	TERMINAL NAME	DESCRIPTIONS
1	OUT	Signal Output	• The output is negative polarity (high level at no signal). • An output signal terminal.
2		Integrator Capacitor	• This capacitor integrates the carrier waveform after it is detected the peak.
3		Tune Coil	• The gain is determined by "Q" of the coil connected to the pin 3 and the externally mounted resistance of the pin 6.
4		Peak Capacitor	• The waveform of the tuning coil is detected meeting the signal peak to be applied to the peak detector.
5	GND	Ground	• The device ground terminal.
7	IN	Signal Input	• An input signal terminal. • To prevent saturation of the input terminal due to an external light, ABLC (Automatic Bias Level Control) circuit is used in the input section, which operates against a strong external light and fixes the bias level of the input terminal.
8	Vcc	Power Supply	• A device power supply terminal.

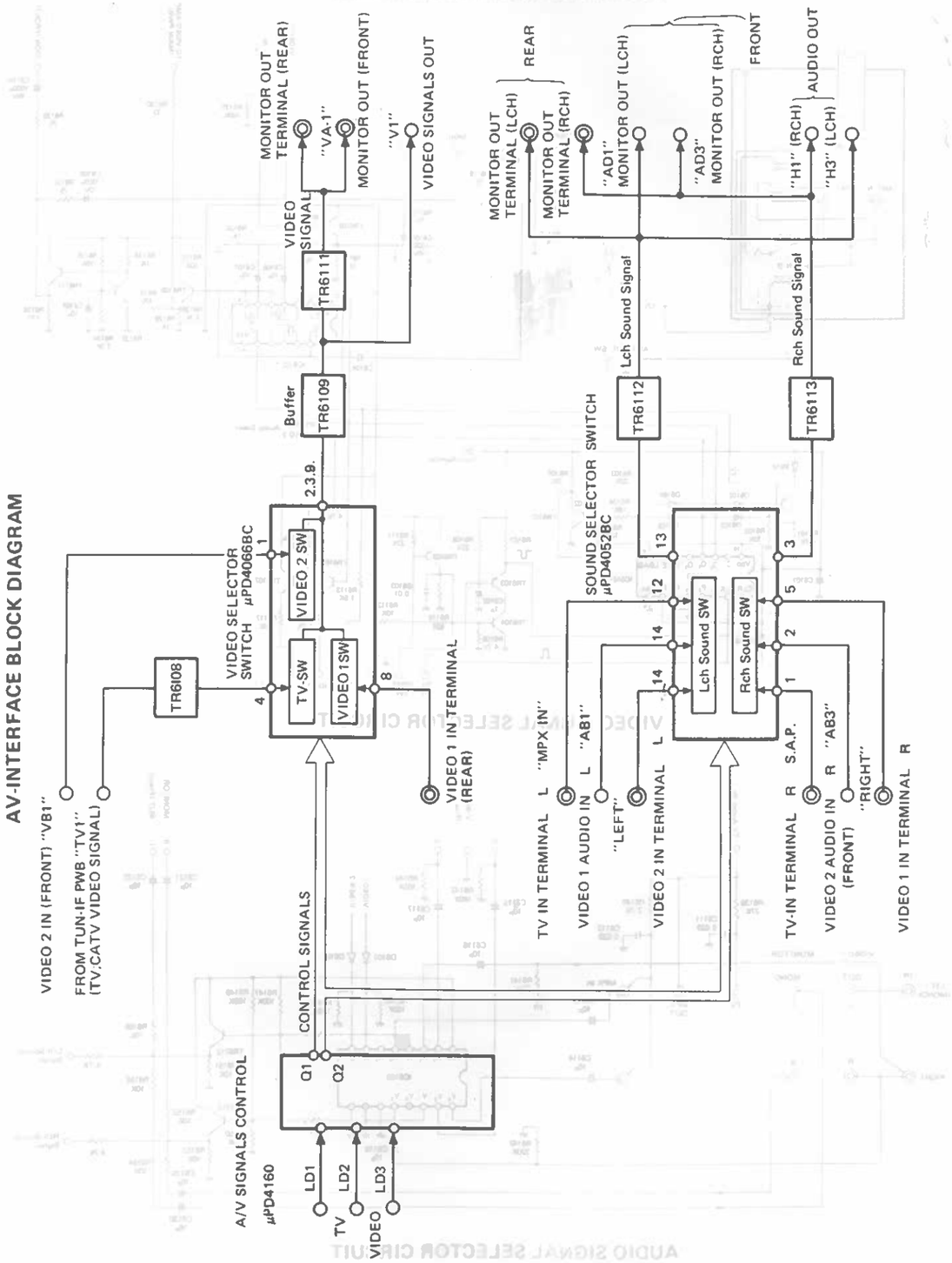
VIDEO/AUDIO INTERFACE CIRCUIT

To convert the video and audio input signals of equipment connected to the VIDEO-1 and VIDEO-2 inputs as well as the TV/CATV input signals, an presettable counter IC (IC6101 μPD4160) is utilized. This also serves as an electrical switching circuit which performs simultaneous switching for the video signal IC (IC6102 μPD4066BC) and the audio signal switch IC (IC6103 μPD4052BC) and is also utilized to eliminate chattering and noise when changing operating modes for the monitor unit.

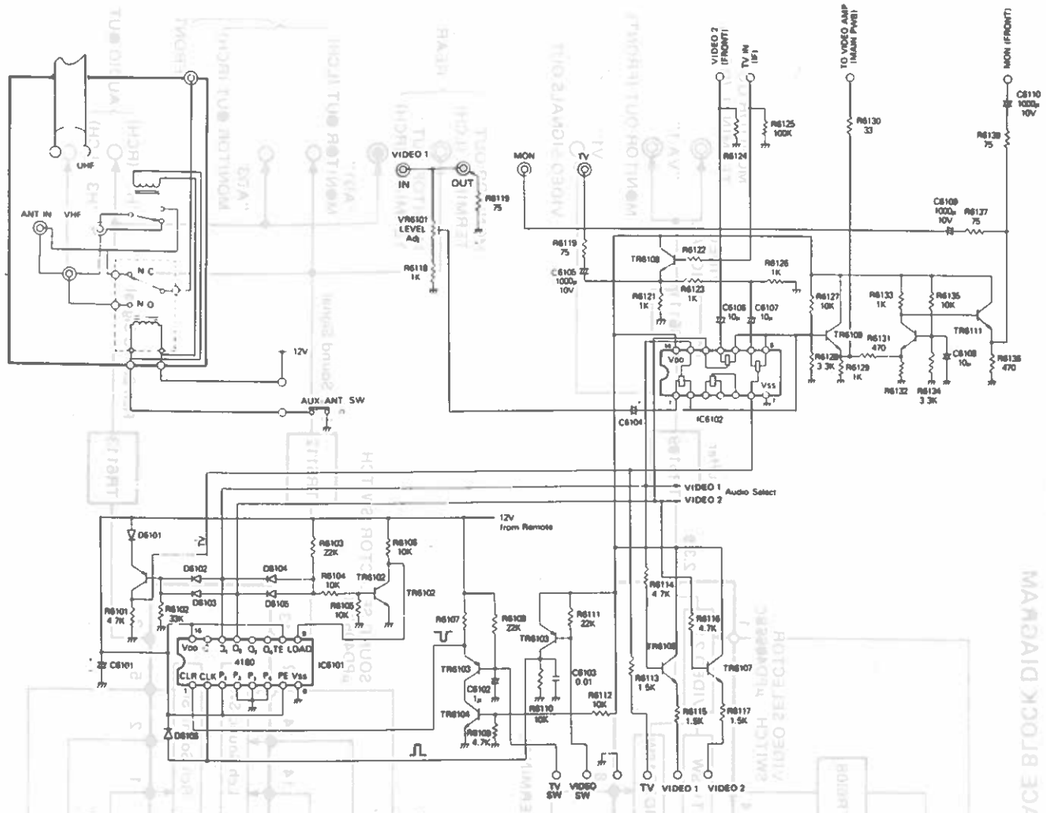


μPD4160BC

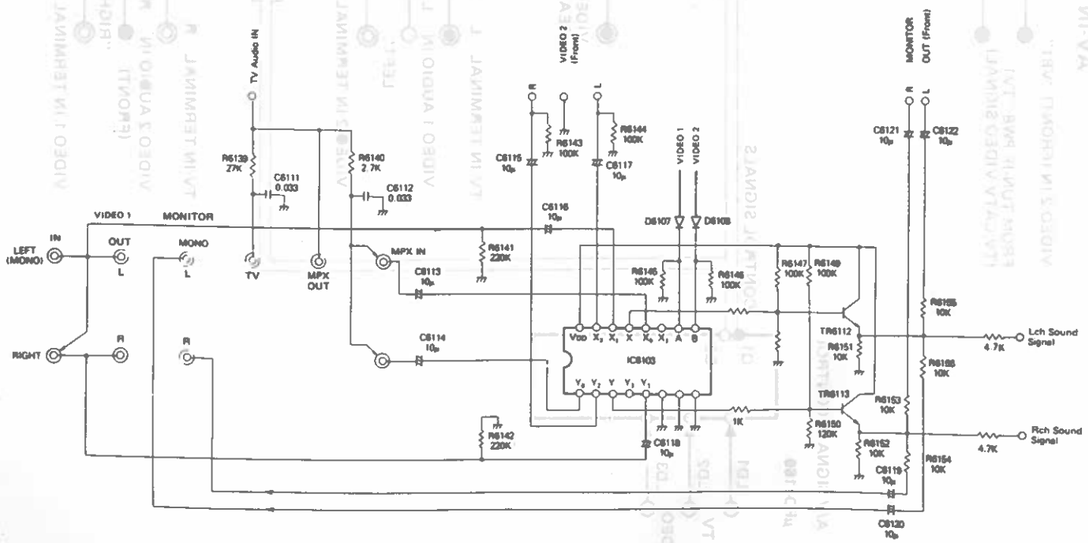
AV-INTERFACE BLOCK DIAGRAM



AUDIO/VIDEO SELECTOR CIRCUIT



VIDEO SIGNAL SELECTOR CIRCUIT



AUDIO SIGNAL SELECTOR CIRCUIT

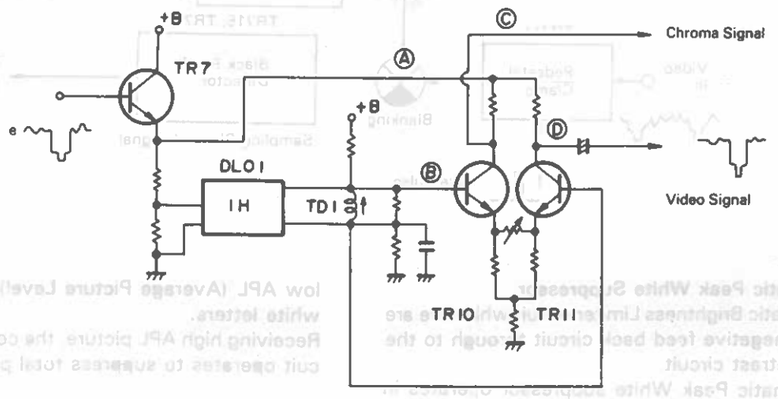
COMB FILTER CIRCUIT

A positive picture signal (sync netative) applied to the base of TR7 is separated into the chroma and video signals by the comb filter circuit.

1. Point (B) waveform is delayed 1H, which is included 180° phase reversed chroma signal.
2. Is point (A) waveform is Y + C, it will be Y – C at point (B). (Y is video signal and C is chroma signal)

Hence, at point (C), (Y + C) — (Y – C) = 2C which is chroma signal separated from composite video signal will be obtained and since this is in same phase as in point (A).

3. At point (D), (Y + C) + (Y – C) = 2Y will be obtained and it is the video signal separated from composite video signal.



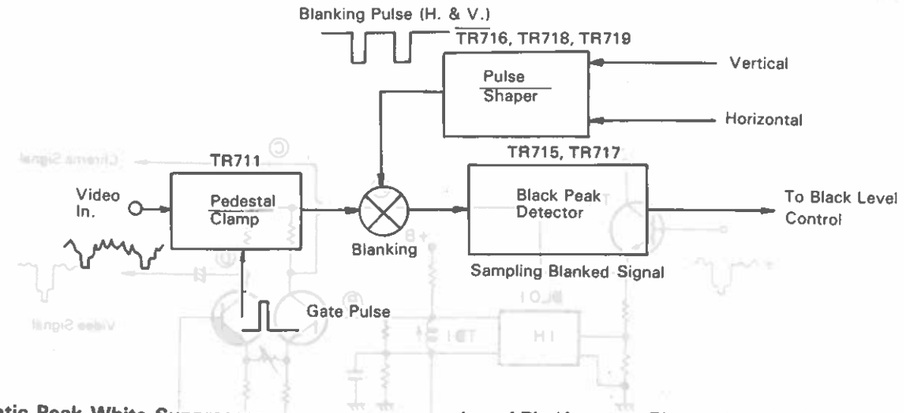
Comb Filter Circuit

VIDEO AND CHROMA PROCESS

1. Automatic Black Level Retention

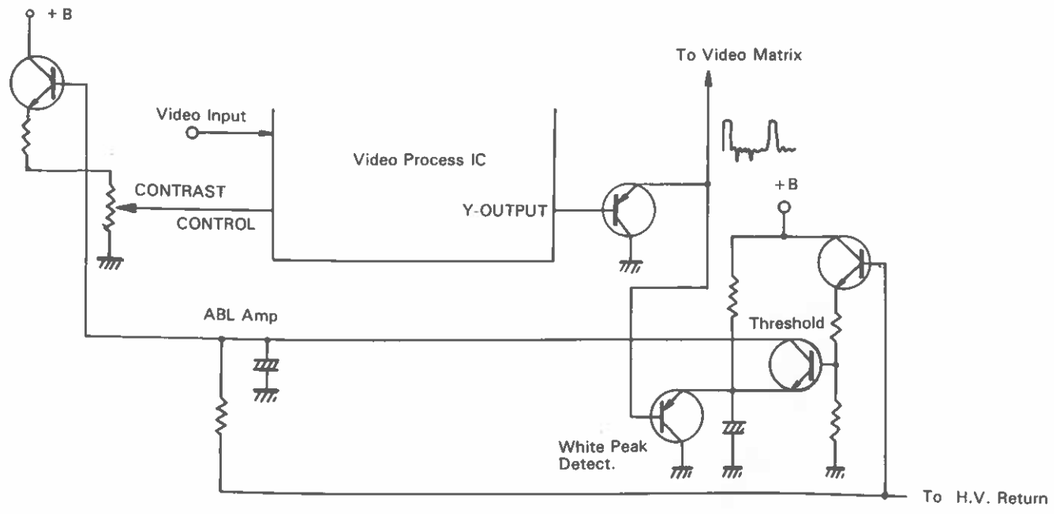
If the off-aired broadcasting signals have not any black level error correspond to these pedestal level, the 100% DC restoration should be the best way to get the best stability of the black level. But, unfortunately, these black levels are often floating from pedestal level.

The Automatic Black Level Retention circuit keeps the black level of the picture to that of the picture tube, even if the signal has floating black level.
The principle of the circuit is, the circuit searches the most black portion of the picture, and if the level goes up from the reference, the circuit sink the black level to the black level of the picture tube.



2. Automatic Peak White Suppressor

The Automatic Brightness Limiter circuit which we are using has negative feed back circuit through to the picture contrast circuit.
The Automatic Peak White suppressor operates in order to suppress the blooming when receiving very low APL (Average Picture Level) picture with peak white letters.
Receiving high APL picture, the conventional ABL circuit operates to suppress total picture level.



3. Luminance Video Section

The composite signal from the comb filter circuit is fed to the delay line and applied to pin 27 of IC701.
The gate pulse will be used for pedestal clamping so the luminance signal is fed through capacitor C725.
The pedestal clamp level is controlled through the charging and discharging of capacitor C725 connected to pin 25 of IC701.
The clamped luminance signal will appear at pins 15 – 17 of IC701 and is blanked by horizontal and vertical blanking pulses fed to the pin 22 of IC701.
The luminance signal is output from pin 21 to the base of video output transistors.

3.1. Automatic Color Control (ACC)

The chrominance signal is passed through chroma band-pass filter (C738, C739 and L709) to pin 4 of IC701.
Fed chrominance signal is amplified and gated by burst gate pulses at pin 7 from sync separator output of IC401.

3.2. Automatic Phase Control (APC)

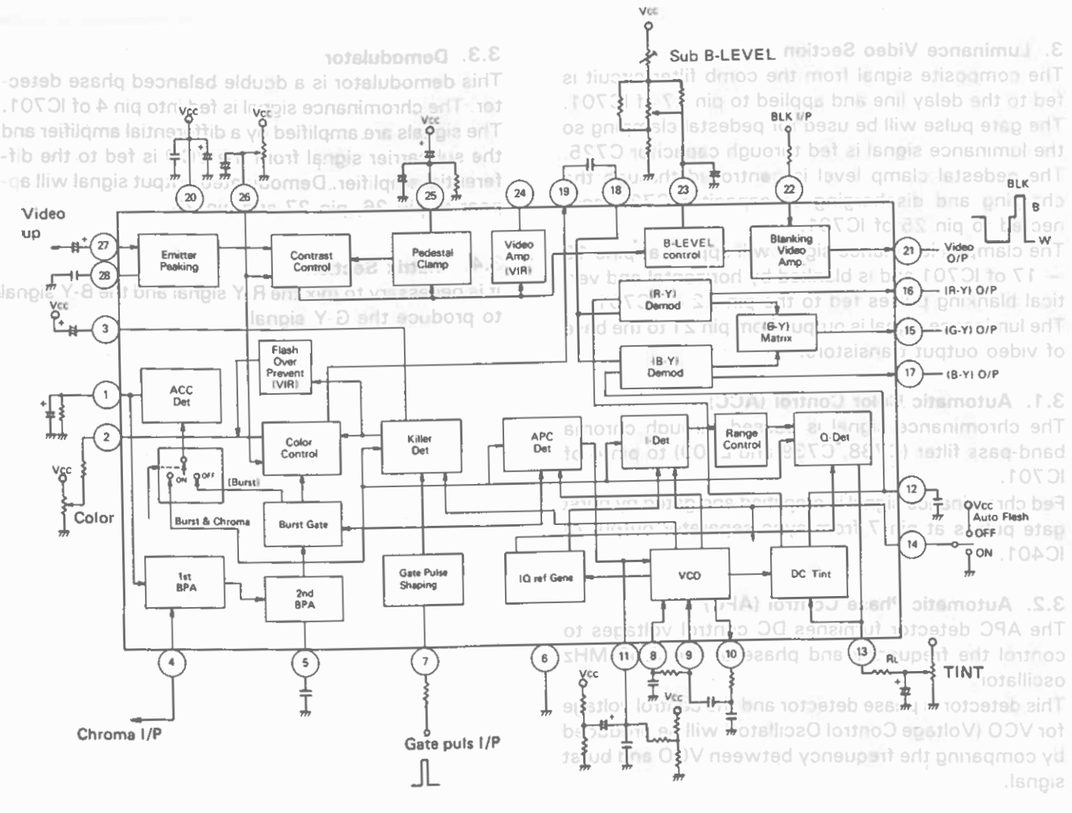
The APC detector furnishes DC control voltages to control the frequency and phase of the 3.58 MHz oscillator.
This detector is phase detector and the control voltage for VCO (Voltage Control Oscillator) will be produced by comparing the frequency between VCO and burst signal.

3.3. Demodulator

This demodulator is a double balanced phase detector. The chrominance signal is fed into pin 4 of IC701.
The signals are amplified by a differential amplifier and the subcarrier signal from the VCO is fed to the differential amplifier. Demodulated output signal will appear at pin 26, pin 27 and pin 28.

3.4. Matrix Section

It is necessary to mix the R-Y signal and the B-Y signal to produce the G-Y signal.



Block Diagram (Video Chroma Process)

3.5. Auto Flesh Circuit

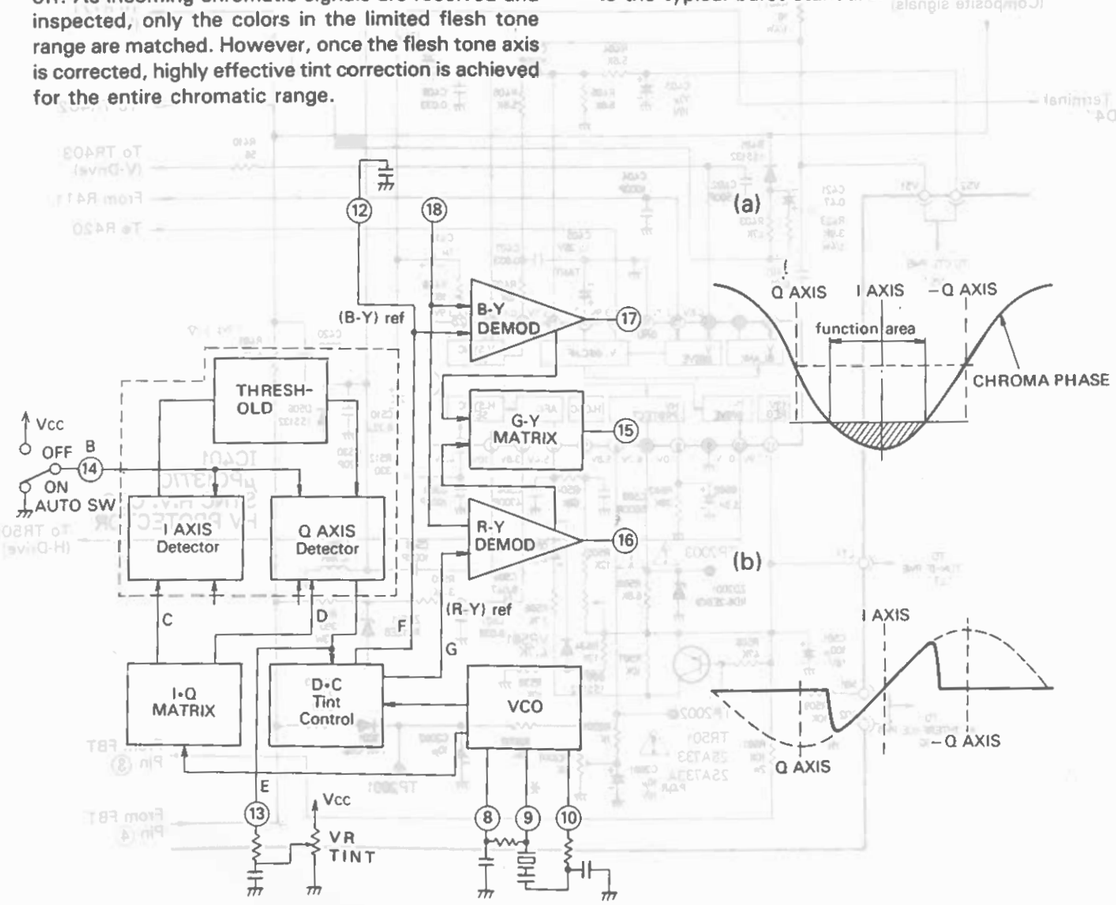
"Auto Flesh" Color Tint Correction System

TV signals transmitted from television stations are sent to homes via transmission networks and relay stations using a variety of video transmission equipment. However, in the process, there is a tendency for signal quality to become somewhat distorted, and the image produced on the home television screen differs in quality from the original image sent by the television station. These differences often take the form of loss of general image quality, alteration of color or tint and variations in the color saturation level.

To deal with this particular problem, this model has been equipped with a newly developed "Auto Flesh" System. Unlike conventional color tint correction systems which attempt the difficult adjustment of the entire color tint range, the "Auto Flesh" System achieves highly effective color tint correction by concentrating tint adjustment on the limited flesh tone range, which most readily indicates that color tint is off. As incoming chromatic signals are received and inspected, only the colors in the limited flesh tone range are matched. However, once the flesh tone axis is corrected, highly effective tint correction is achieved for the entire chromatic range.

The area inside the dotted portion of the block diagram is the tint correction area of the circuit. As a method of determining the tint adjustment area, (a) a threshold is established in relation to the chroma phase, at the DC output point of the I Axis detector. Then, the adjustment area is determined by turning on the correction circuit (the Q axis detector) for only the color tint in this fixed area.

The correction signal within the DC output area of the Q axis detector and centering on the I axis, utilizes plus, minus control voltage with linearity characteristics for the control area explained above. (b) Then, by feeding back the DC voltage through the DC tint terminal E (pin 13), the phases of the (B-Y) ref signal F and the (R-Y) ref signal G are altered, thereby effecting tint correction. In addition, the I axis ref signal C, which is input into the I axis and Q axis detectors, and the Q axis ref signal D, are sent from the VCO through the I, Q matrix circuits, then held at a fixed phase of 295° in relation to the burst signal, which is the typical burst standard.



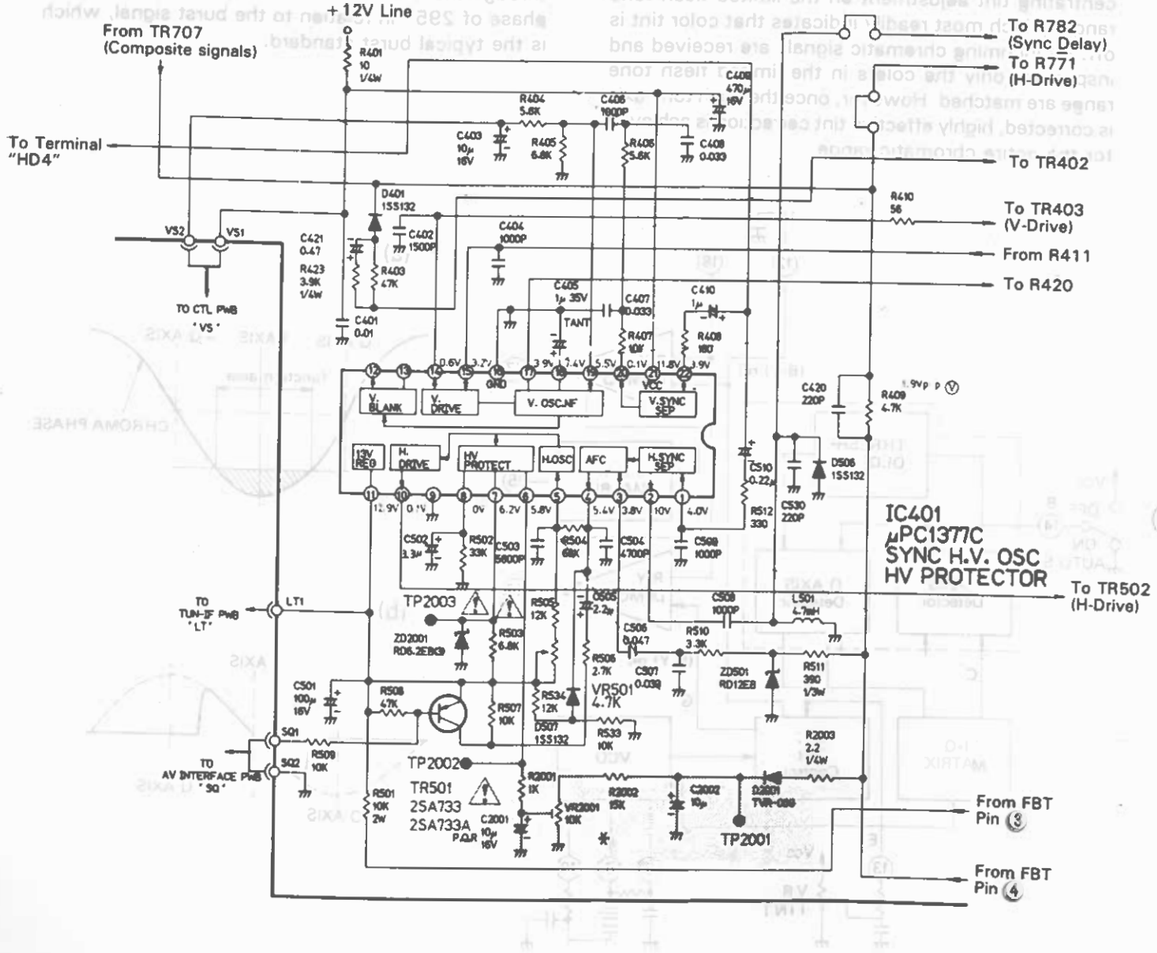
Block Diagram (Video Chroma Process)

DEFLECTION CIRCUIT

1. μPC1377C (For deflection control)

The deflection circuit consists of circuits such as Vertical synchronous separation, Horizontal synchronous separation, Vertical synchronous amplification, Horizontal synchronous amplification, Vertical oscillation, Vertical driver, AFC, High voltage protection, Horizontal oscillation, Horizontal driver, and Shunt regulation circuits. The circuit has significant features as listed below.

- With independent synchronous separation circuits for horizontal or vertical signals, operations are very stable even in a weak electric field.
- Power supply ground lines for Horizontal portion and Vertical portion are independent from each other.
- Width of Vertical blanking can be freely set from outside of the circuit.
- Thermal characteristics of both Vertical and Horizontal oscillation circuits is superior and stable.
- High voltage protector is a circuit which prevents abnormal high voltage with high sensitivity and high performance.



(1) Synchronous separation circuits

In order to separate Vertical and Horizontal sync signals at the appropriate levels, separate synchronous separation circuits are provided and synchronous separation is performed by charging/discharging external capacitors connected to pins 1 and 22.

(2) AFC circuit

Phase comparison of the Horizontal sync signal and Flyback pulse signal is performed as follows. The Horizontal sync signal is applied to the constant current circuit of the differential amplifier in the IC where it is compared with the saw tooth wave of the Flyback pulse applied to pin 3. Pulse current compared and detected by above process is the output current of pin 4. It controls the oscillation frequency by controlling the charging/discharging voltage of pin 5 through a resistor.

(3) Horizontal oscillation circuit

Oscillation frequency is determined by the sum of charging time constant of the external resistor and the capacitor connected to pin 5 and that of internal resistor and external capacitor.

(4) Vertical oscillation circuit

The saw tooth wave is formed by a Schmitt circuit in the IC and the charging/discharging of an external capacitor connected to pin 18. Since the charging/discharging of the external capacitor of pin 18 is performed with charging/discharging circuit of constant current, a very linear saw tooth wave is available.

(5) Vertical sync circuit

Separated vertical sync signal is integrated by a CR connected between pins 19 and 20. Charging of an external capacitor at pin 18 is designed to be started when the sync signal component overlaps the free running oscillation frequency of the IC.

(6) High voltage protector

The protector has a function to shut off horizontal oscillation pulse at pin 10 when the voltage of the rectified flyback pulse applied to pin 6 becomes higher than the standard voltage at pin 7.

WIDE SOUND CIRCUIT (S-WIDE)

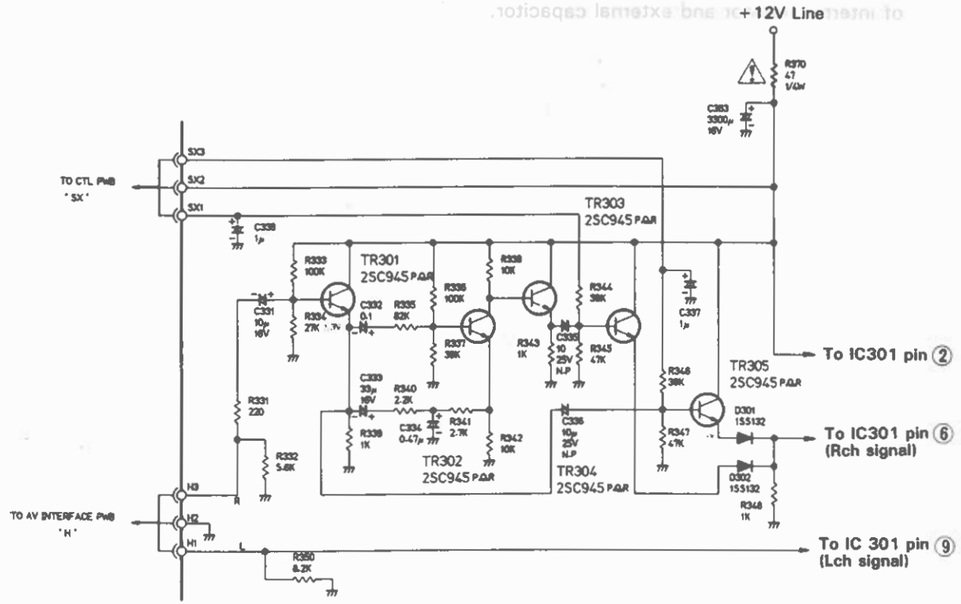
The Wide Sound circuit functions to give ambience to the overall sound field to create a simulated stereo effect. In the operation of this circuit, the audio input signal for both the L and R channels is selected by IC6103 (μPD4052BC) of the AV-INTERFACE circuit and input into the wide sound circuit. To accomplish the simulated stereo effect, as the diagram shows, the L channel signal is processed normally, while the R channel signal is put through a phase shift.

The "S-wide" ON Mode

When the S-Wide switch is turned on, to activate the wide sound circuit, the R channel signal is widened by TR301 and put through two filter circuits. The high frequency audio input filtered by the time constants of C232, R355 and R337 and the low frequency audio filtered by the time constants of C333, R340, C344 R341 and R342 are then combined the base and emitter of TR302 to create a phase shift circuit. In addition to employing TR302 to widen the R channel signal, TR304 is used as a buffer.

The "S-wide" OFF Mode

In the monaural mode, the widened R channel signal is diverted through C336 on the emitter side to be input at the base of TR305. TR305 serves as the switching circuit for the "S-Wide" button on the monitor front panel. When the sound wide circuit is activated TR305 is turned off. It is conversely turned on for monaural sound output, in which instance audio signals are sent through D301 and output through the subsequent control IC.



Wide Sound Circuit

TROUBLESHOOTING

1. Power fails to turn ON. No Sound, No Rasten, No attempt to turn on.

Check Fuse F651 (4A), F652 (2A) on DC-PS PWB (PWC1615)

- Open (F651) — Replace
  - Trouble removed
  - New Fuse also opens
    - Defective Transformer T691
    - Defective secondary power circuit
- Open (F652) — Replace
  - Trouble removed
  - New Fuse also opens
    - Defective power supply circuit
    - Defective secondary power circuit

Normal

- Check + 115 V supply voltage at terminal "Q1"
  - 0 V — Check voltage at D671
    - 0 V — Defective Switching Transformer T651
    - Defective D671 or its peripherals
  - Normal — Check voltage at pin (11) of IC401 on Main PWB
    - 0 V — Defective R501 or IC401
    - Normal (12.9 V) — Defective IC401 or its peripherals
  - Check voltage at pin (14) of IC101 on TU-IF PWB
    - 0 V — Defective TR113, TR114 or its peripherals
    - Normal (12.9 V) — Defective IC101 or its peripherals
  - Check voltage at pin (6) of IC102 on TU-IF PWB
    - 0 V — Defective T691 or its peripherals
    - Normal (–25 V) — Defective IC102 or its peripherals
- Check voltage at terminal "CP" on TU-IF PWB
  - Normal — Defective T691, D111 or its peripherals
  - Abnormal — Defective D655, TH651 or its peripherals

2. No Sound, picture is normal

- Check +20 V voltage at terminal "G1" on Main PWB
  - 0 V → Check voltage at D672 on DC-PS PWB
    - 0 V → Defective D672 or its peripherals
    - Normal → Defective Switching Transformer T651
  - Normal
    - Check +12 V voltage at pin (2) of IC301 on Main PWB
      - 0 V → Defective R370 or its peripherals
      - Normal → Defective IC301 or *1AV-INTERFACE PWB
    - Check whether hum sound appears when you touch Terminal "VL2" on Main PWB
      - Hum sound appears → Defective *1AV-INTERFACE circuit; Defective IC101 or ports between pin (22) of IC101 to terminal "VL2" peripherals
      - Not appear
        - Check sound with earphone
          - OK → Check speaker select switch or replace speaker
          - No Good → Defective IC302 or its peripherals

3. *1AV-INTERFACE PWB AUDIO SECTION

- Check waveform at terminals "H"
  - Normal → Check voltage at terminal "BT2" on Main PWB
    - 0 V → Defective R370 and +12 V line
    - Normal → Check waveform at pins (6), (9) of IC301
      - Normal → Defective IC301 or its peripherals
      - Small or zero → Defective wide sound circuits
  - to "A"

- A
- Small or zero
- Check voltage at pin (16) IC6103
  - 0 V → Check voltage at terminal "IB1" (12 V)
    - Normal → Defective 12 V line of TU-IF PWB
    - 0 V → Defective IC6103, C6101 or its peripherals
  - Normal → Check voltage at terminal "IB2" (12 V)
    - 0 V → Defective 12 V line of Main PWB
    - Normal
      - Check voltage at collector TR6113 and TR6112
        - Normal (11.0 V) → Defective R6157, R6158
          - Check voltage at pins (9), (10) of IC6103
            - Normal → Defective IC6103
            - Abnormal → Defective IC6101 or its peripherals; Defective function switch (TV, VIDEO)
        - Abnormal → Defective R6173, C6125 or its peripherals
          - Check voltage at base of TR6112 and TR6113
            - Normal (5.6 V) → Defective TR6112 and TR6113 or its peripherals
            - Abnormal → Defective R6169, R6168 and IC6103; Defective IC6101

4. Sound and raster are normal but no picture

- Check waveform at TP701
  - Small or zero → Check waveform at terminal "V1"
    - No output → Defective AV-INTERFACE PWB
    - Normal → Check waveform at collector of TR704
      - No output → Check waveform at emitter of TR702
        - No output → TR702, TR703 and parts connecting between terminal "V1" and base of TR702 defective
        - Normal → TR704 and comb filter circuit failure
      - Normal → Check waveform at emitter of TR707
        - No output → TR706, TR707 and parts connecting between TR704 and TR707 failure
        - Normal → Defective R726, R727 and R728
  - Normal → Check waveform at pin (21) of IC701
    - Small or zero → Check waveform at pin (27) of IC701
      - No output → TR710 and parts connecting between TP701 and pin (27) of IC701 failure
      - Normal → Check voltage at pin (25) of IC701
        - Abnormal → IC701 and parts connecting between (25) and (26) of IC701 defective
        - Normal → Defective IC701 or its peripherals
    - Normal → Check waveform at terminal "Y6"
      - Small or zero → Defective TR722 or its peripherals
      - Normal → Defective VIDEO CRT PWB circuit

5. No video from Monitor out in any mode

- Check voltage at base of TR6111 on AV-INTERFACE PWB
  - 0 V → Check voltage at collector of TR6111
    - Abnormal → Defective R6133 or its peripherals
    - Normal → Defective R6137, C6109 or output terminal
      - Defective R6138, C6110 or output terminal
  - Normal → Check voltage at collector of TR6110
    - 0 V → Defective R6133
    - Normal → Defective R6135, R6131, or TR6110 peripherals

6. No video from Monitor out Video-1 mode (Normal operation in TV and Video-2 mode)

- Check waveform at pin (8) of IC6102
  - No output → Check connectors
    - Normal → Defective C6104, VR6101
    - Make correction
  - Normal → Check voltage at pin (6) of IC6102
    - Normal (11.8 V) → Defective IC6102
    - Abnormal → IC6101 and parts connecting to pin (14) defective

7. Cannot receive TV channel (CATV channels normal)

Is TV indicator lighted up?

- No → Push the TV button
- Yes → Set the channel plan switch to AIR position

Check voltage at pin (2) of IC103

- Normal (15 V) → Defective UHF/VHF Tuner
- Small or zero → Defective IC103 or its peripherals

Check voltage at pins (23) ~ (24) of IC101. Reference to the following chart:

PIN NO. \ BAND	2 ~ A – 3	A – 2 ~ R	S ~ WW	14 ~ 83
24, (B01)	L	H	L	H
23, (B02)	L	L	H	H

- Abnormal → Defective IC101
- Normal → Defective IC103 or its peripherals

8. Cannot receive CATV channel (TV channels normal)

Is TV indicator lit?

- No → Push the TV Button
- Yes → Set the Channel plan switch to CATV position

Check voltage at pin (7) of IC103 on Main PWB

- Normal (15 V) → Defective combination Tuner TU101
- 0 V or Low voltage

Check voltage at pin (23) ~ (24) of IC101. Reference to the following chart:

PIN NO. \ BAND	2 ~ A – 3	A – 2 ~ R	S ~ WW	14 ~ 83
24, (B01)	L	H	L	H
23, (B02)	L	L	H	H

- Abnormal → Defective IC101
- Normal → Defective IC103 or its peripherals

9. Scan does work. (TV and CATV channels)

Check conductivity of TR110 and ZD103

- Abnormal — Check voltage at collector of TR112
  - 0 V or Low — Defective ZD103 or R134
  - Normal (33.5 V) — Defective TR112 or its peripherals
  - Defective TR110, TR111 and association circuit
- Normal — Defective IC101 or IC102

10. Channel Up/Down does not stop at desired channel

Check voltage at pins (10), (11) of IC101, when channel Up/Down button is pressed

- Abnormal — Check connector "KV"
  - Normal — Defective channel Up/Down button
  - Defective IC101
  - Make up connector

Normal

Check voltage at pin (28) of IC101

- No — Defective IC101

Normal — Check voltage at TR104

- Normal — Defective IC101 or its peripherals
- Abnormal — Defective IC102 or its peripherals

11. Blanked Digits or Segments in CH Display

Check voltage at terminals "LT3" and "LT4" for digit control

- No — Defective +12 V line

Normal — Check voltage at terminals "SB1" to "SB7" on CH-LED PWB

- No — Defective IC101

Normal — Defective LED

12. No horizontal or vertical hold

Check waveform at terminal "HD5"

- Normal — Defective IC401
- Small or zero — Check waveform at terminal "V1"
  - Normal — Parts between terminal "V1" and Video buffer TR707 emitter defective
  - Abnormal — Defective AV-INTERFACE circuit

13. No horizontal hold (Vertical hold works)

Moving H-HOLD VR, check whether the picture frame is complete or not.

- A complete picture appears sometimes — Check waveform at pin (1) of IC401
  - Normal — IC401 and related parts defective
  - No output — F.B.T. pulse comparator in failure
- Horizontal hold fails completely or works weakly.
- No complete picture appears f_H is wrong — Parts between pin (4) and pin (5) of IC401 defective

14. No vertical hold (Horizontal hold works)

Moving V-HOLD VR, check whether the picture frame is complete or not.

- A complete picture appears sometimes ——— IC401 and parts connecting between pins (20) and (22) defective
- Vertical hold fails completely or works weakly.
- No complete picture appears(VH is wrong) ——— IC401 and parts connecting between pin (17) and (19) defective

15. Raster is distorted or vertical amplitude is reduced.

Check waveform at pin (14) of IC401

- Normal ——— Check voltage at TR401 and TR402
  - Normal ——— Deflection yoke or C418 and VR401 defective
  - Abnormal ——— TR401, TR402 and related parts defective
- Small or zero ——— Check waveform at pin (18) of IC401
  - Normal ——— Check voltage at pin (15) of IC401
    - Normal (6.2 V) ——— Parts (C418, VR401 and R419) of feedback loop defective
    - Abnormal ——— Defective C405
  - Small or zero ——— IC401 and parts connecting between pin (19) and pin (20) defective

16. No color (B/W normal)

Check waveform at pin (4) of IC701

- Small or zero ——— Check waveform at emitter of TR705
  - No output ——— Defective TR705 or its peripherals
  - Normal ——— Defective R786 or 3.58 MHz filter circuit

Normal

Check waveform at pin (7) of IC701

- No output ——— Check waveform at pin (2) of IC401
  - No output ——— Defective IC401
  - Normal ——— Parts connecting to IC401 pin (2) and IC701 pin (7) defective
    Defective IC701

Normal

Check waveform at pin (9) of IC701

- No output ——— Check voltage at pin (11) of IC701
  - Normal ——— IC701 and parts connecting between pins (10) and (8) defective
  - Abnormal ——— Defective R796, R792 and C751

Normal

Check voltage at pin (18) of IC701

- Abnormal ——— IC701 and parts connecting to pins (18) and (19) defective
- Normal ——— Defective IC701

17. White balance abnormal

Adjust white balance again

- Check connectors
  - Normal — Check CRT cathode voltage
    - Wrong voltage at cathode
      - Check DC output voltage of the color at IC701
        - Abnormal — Defective IC701
        - Normal — Associated color output circuit defective
          - Spark gap defective
    - All proper — CRT defective
  - Make correction
- Trouble removed

18. No or erratic remote control

Check if the LED on the top of transmitter lights when a button is depressed

- When a button is depressed
  - LED doesn't flash — Replace the batteries or the transmitter
  - LED flashes — Check voltage at terminal "Y1" on Main PWB
    - 0 V — Defective 12 V line
    - Normal
      - Check voltage at terminal "Y2", when a button of transmitter is depressed
        - Low — Defective IC101
        - High — Defective photo diode head Amp. unit

IC/TRANSISTOR VOLTAGE CHART

IC VOLTAGE CHART

Note: CH11 Standard Color Bar Signal Receiver.

Unit: V

SYMBOL	IC TYPE	CIRCUIT	VOLTAGE PIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC101	μPD1709C511	PLL, VIF (PWC 1605) PLL, REMOCON		4.7	0.1	1.0	4.7	4.7	4.7	4.6	GND	4.7	4.7	4.7	4.6	2.7	5.0
				15	16	17	18	19	20	21	22	23	24	25	26	27	28
				0.1	4.7	2.3	2.2	4.7	0.1	1.9	0	0.2	0	12.7	12.7	4.8	5.0
IC102	μPD625C	PLL, VIF (PWC 1605) M-NOS MEMORY		1	2	3	4	5	6	7	8	9	10	11	12	13	14
				GND	4.7	4.7	4.7	4.7	-25	-11.1	4.7	GND	GND	4.6	4.7	4.7	4.7
				15	16												
				4.6	5.0												
IC103	LA7910	PLL, VIF (PWC 1605) BAND SELECTOR		1	2	3	4	5	6	7	8	9					
				0.2	15.5	0.2	0	GND	17.2	0	0	15.7					
IC104	μPD4027BC	PLL, VIF (PWC 1605)		1	2	3	4	5	6	7	8	9	10	11	12	13	14
				0	11.7	11.8	0	12.7	12.7	GND	GND	GND	GND	GND	GND	GND	GND
				15	16												
	MOS			–	12.7												
IC151	M54516P	DISP/CTL (PWC 1607B) DIGIT BUFFER		1	2	3	4	5	6	7	8	9	10	11	12	13	14
				–	0.7	0.7	0.7	0.7	GND	GND	–	–	0.9	1.3	1.4	1.0	–
IC152	M54563P	DISP/CTL (PWC 1607B) SEGMENT BUFFER		1	2	3	4	5	6	7	8	9	10	11	12	13	14
				–	–	–	–	–	–	–	–	–	–	–	–	–	–
				15	16	17	18										
				–	–	–	–										
IC153	μPD652C	DISP/CTL (PWC 1607B) SERIAL-7 SEG DECODER		1	2	3	4	5	6	7	8	9	10	11	12	13	14
				1.8	4.7	–	–	–	–	–	–	–	–	–	–	–	4.7
				15	16	17	18	19	20	21	22	23	24	25	26	27	28
				–	–	–	–	–	–	–	–	–	–	–	–	GND	2.3

SYMBOL	IC TYPE	CIRCUIT	VOLTAGE													
			PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC201	μPC1356C2	PLL, V.I.F. (PWC 1605)	9.7	9.7	GND	3.2	11.4	3.9	5.0	5.0	3.9	2.3	3.0	2.3	12.0	GND
		V.I.F.	15	16	17	18	19	20	21	22						
			4.5	5.3	2.0	5.2	5.2	5.2	5.2	7.1						
IC301	AN5835	MAIN (PWC 1536) SOUND CONTROL	1	2	3	4	5	6	7	8	9	10	11	12	–	–
			5.0	9.9	6.5	3.3	5.0	3.4	GND	5.0	3.3	7.0	3.3	1.2	–	–
IC302	AN7158N	MAIN (PWC 1536) SOUND OUTPUT	1	2	3	4	5	6	7	8	9	10	11	12		
			22	11.4	0	0	1.2	21.2	21.2	1.2	0	0	11.4	22		
IC401	μPC1377C	MAIN (PWC 1536) DEFLECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			4.0	10.0	3.8	5.4	--	5.8	6.2	0	–	0.1	12.9	–	–	0.6
			15	16	17	18	19	20	21	22	–	–	–	–	–	–
			3.2	–	3.9	7.4	5.5	0.1	11.8	3.9						
IC701	HA11436A	MAIN (PWC 1536) VIDEO & CHROMA PROCESS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			4.9	10.0	6.1	0.1	0.2	0	0	3.0	3.0	9.3	7.1	4.5	3.7	10.9
			15	16	17	18	19	20	21	22	23	24	25	26	27	28
			6.2	6.3	6.4	2.8	9.5	10.9	5.5	0.2	8.1	–	8.9	5.7	0.1	0.6
IC401	μPC1373H	PRE, AMP	1	2	3	4	5	6	7	8						
			–	–	–	–	–	–	–	–						
IC301	μPC1382C	PLL, V.I.F. (PWC 1605) S.I.F. DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			10	--	–	–	3.7	6.5	--	–	6.5	2.4	6.5	3.7	3.6	3.6

SYMBOL	IC TYPE	CIRCUIT	VOLTAGE													
			PIN 1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC6101	μPD4160	INTERFACE (PWC 1588)	12.6	0	12.7	0	0	0	12.7	0	12.6	12.7	0	0	0.1	0
			15	16												
			0	12.7												
IC6102	μPD4066BC	INTERFACE (PWC 1588)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			4	4.3	4.3	4.3	11.8	0	0	3.8	4.3	0	0	0	0.1	12.8
IC6103	μPD4025BC	INTERFACE (PWC 1588)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
			5.5	–	5.5	0	–	0	0	0	0.1	0	0	5.5	5.5	0
			15	16												
			0	12.7												

TRANSISTOR VOLTAGE CHART

Unit: V

	CIRCUIT	SYMBOL	TYPE	VOLTAGE		
				EMITTER	BASE	COLLECTOR
TUN.I.F.PWB, PWC 1605	Clock Signal Switching	TR104	2SC945	4.2	4.6	4.6
	Signal Waveform Conection	TR105	2SC945	–	–	–
	Sound Signal Buffer	TR106	2SC945	–	0	0
	Sound Signal Buffer	TR107	2SC945	–	–	0
	Power Signal Buffer	TR109	2SC2002	–	0.7	0.1
	Tuning Signal Amplifier	TR110	2SK118R	1.4	1.3	12.7
	Tuning Signal Buffer	TR111	2SC945	12.2	12.7	33.5
	Tuning Signal Buffer	TR112	2SC945	11.6	12.2	33.5
	12.7 V Regulator	TR113	2SD471	5.6	6.3	12.7
	5.6 V Regulator	TR114	2SD401	12.7	13.3	17.1
	Ant-Signal Switching	TR115	2SC945	–	0.7	0
	Aux-Signal Switching	TR116	2SC945	–	0	12.2
	Signal Buffer	TR117	2SB794	12.7	12.2	0
	Reset Signal Switching	TR151	2SC945	–	0.7	6.8
	Video Buffer	TR201	2SC945	2.3	3.0	12.0
	Video Invertor	TR202	2SC945	2.3	3.0	9.6
	Video Amplifier	TR203	2SC945	8.9	9.6	12.0
	Sound Signal Amplifier	TR301	2SC945	1.9	2.5	10.0
MAIN PWB PWC 1536	Wide Sound	TR301	2SC945	1.3	2.0	9.9
	Wide Sound	TR302	2SC945	2.1	2.7	7.4
	Wide Sound	TR303	2SC945	6.8	7.4	9.9
	Wide Sound	TR304	2SC945	–	–	–
	Wide Sound	TR305	2SC945	4.4	5.0	9.9
	Vertical Output	TR401	2SD401	24.4	24.8	59.9
	Vertical Output	TR402	2SB546	24.4	24.3	–
	Vertical Drive	TR403	2SC1941	–	0.6	24.3
	H-Hold Delete	TR501	2SA733	–	–	–
	H-Drive	TR502	2SC2688	–	0.3	42.9
	15 V Regulator	TR503	2SD471	11.8	12.3	15.7
	H-Output	TR591	2SD870	–	–	–

TRANSISTOR VOLTAGE CHART

Unit: V

	CIRCUIT	SYMBOL	TYPE	VOLTAGE		
				EMITTER	BASE	COLLECTOR
DC-PS PWB PWC 1801	Power Regulator	TR651	2SD1186	0.6	0.5	
	Current Protector	TR652	2SC945	0	0.1	4.4
	Power Regulator Control	TR653	2SA952	0.5	0.4	–
	Error Amplifier	TR654	2SC945	-19.3	-18.8	0.2
MAIN PWB PWC 1536	Video Amplifier	TR701	2SC945	3.4	4.0	8.5
	Video Buffer	TR702	2SC945	7.8	8.5	11.9
	Comb Filter	TR703	2SC945	2.6	3.2	7.4
	Comb Filter	TR704	2SC945	2.6	3.2	7.4
	Chroma Buffer	TR705	2SC945	6.7	7.4	11.9
	Video Buffer	TR706	2SC945	2.6	3.3	6.3
	Video Buffer	TR707	2SC945	5.6	6.3	10.9
	3.58 MHz Trap	TR709	2SC945	–	–	–
	Sharpness	TR710	2SC945	0.1	2.1	8.2
	Pedestal Clamp	TR711	2SC945	3.4	0.1	3.7
	White Peak Control	TR712	2SA733	4.5	5.6	–
	White Peak Buffer	TR713	2SC945	4.5	4.0	5.1
	Invertor Amplifier	TR714	2SC945	3.1	3.7	10.9
	Black Level Detector	TR715	2SA733	2.9	9.3	–
	Invertor Amp.	TR716	2SA733	10.9	10.3	9.3
	Black Level Compensator	TR717	2SC945	0.2	0.8	7.9
	Reverse Blanking	TR718	2SC945	–	0.6	0.1
	Switching	TR719	2SA733	10.9	10.3	8.1
	Picture Control	TR720	2SA733	5.7	5.1	–
	B-LEVEL Control	TR721	2SC945	0.2	0	8.1
	Video Invertor	TR722	2SA733	5.6	5.5	–
VIDEO CRT PWB PWC 1322	Red Signal Output	TR901	2SC2371	6.3	6.2	135.8
	Green Signal Output	TR902	2SC2371	6.1	6.2	125.5
	Blue Signal Output	TR903	2SC2371	6.3	6.3	121.4
AV-INTER FACE PWB PWC 1588	Switching	TR6101	2SA733	11.8	11.2	11.9
	Switching	TR6102	2SC945	–	0.4	12.6

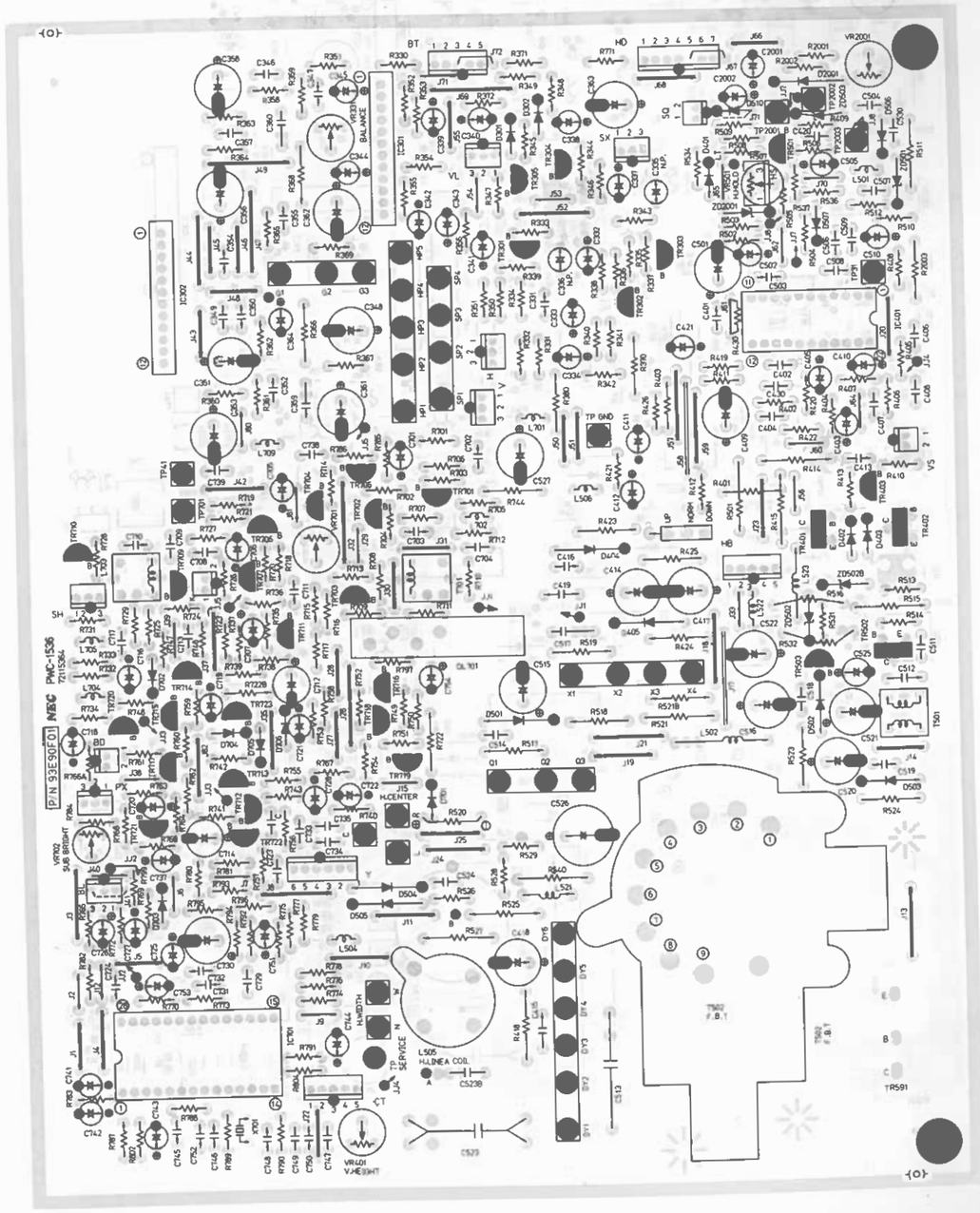
TRANSISTOR VOLTAGE CHART

Unit: V

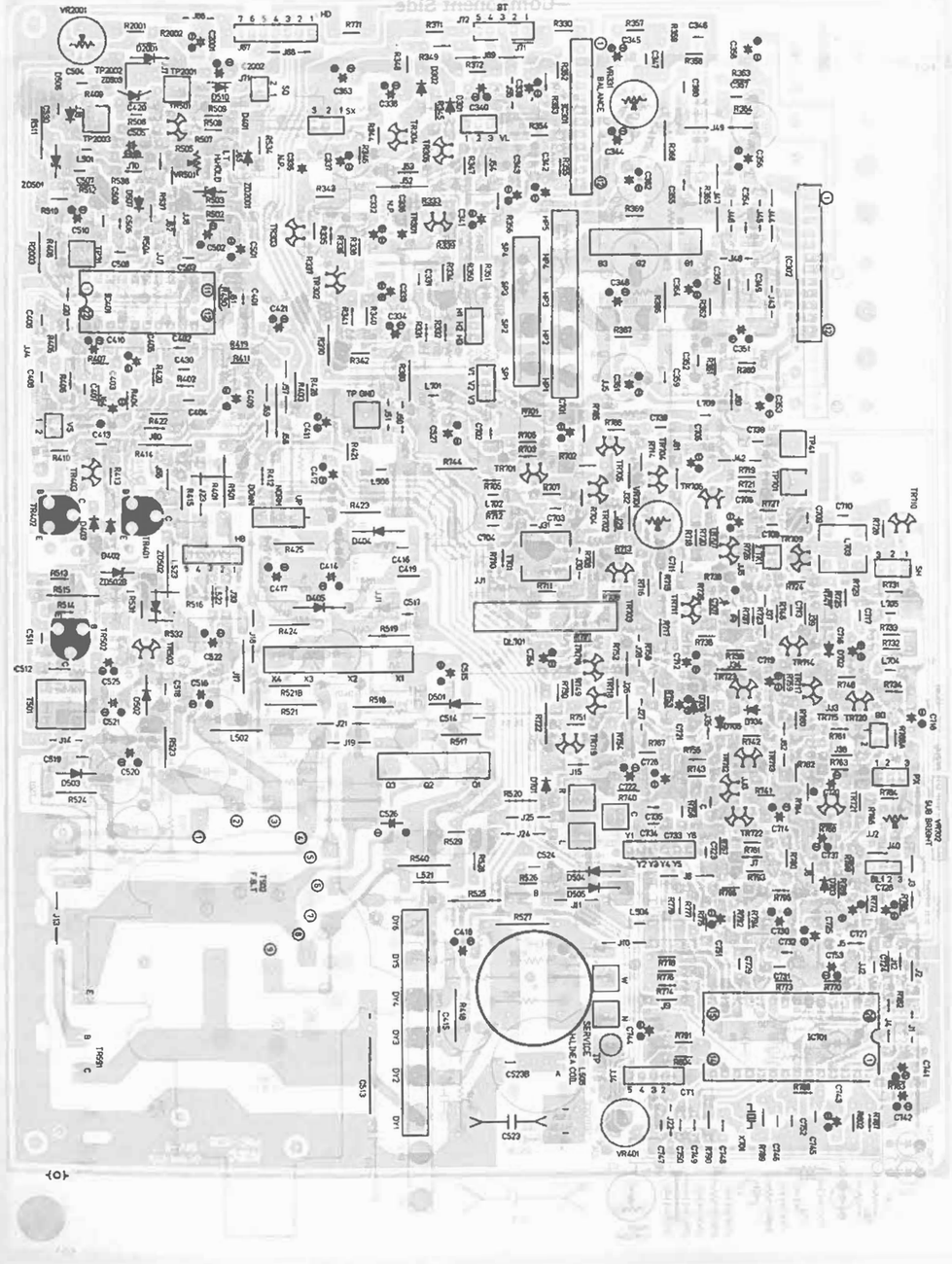
CIRCUIT		SYMBOL	TYPE	VOLTAGE		
				EMITTER	BASE	COLLECTOR
AV-INTERFACE PWB PWC 1588	Switching	TR6103	2SA733	12.6	12.5	–
	Switching Buffer	TR6104	2SC945	–	0.7	0
	Switching Buffer	TR6105	2SA733	12.7	12.5	0
	Switching Buffer	TR6106	2SC945	0	0	–
	Switching Buffer	TR6107	2SC945	0	0	–
	TV-Signal Buffer	TR6108	2SC945	8.2	8.9	12.1
	Video Buffer	TR6109	2SC945	3.6	4.3	11.6
	Monitor Signal Invertor	TR6110	2SC945	2.6	3.3	8.3
	Monitor out Buffer	TR6111	2SC945	7.6	8.3	11.6
	Lch Sound Buffer	TR6112	2SC945	5.2	5.6	11.1
	Rch Sound Buffer	TR6113	2SC945	5.2	5.6	11.1
	H-Hold Control	TR6114	2SC945	–	0.7	0

PRINTED WIRING BOARD

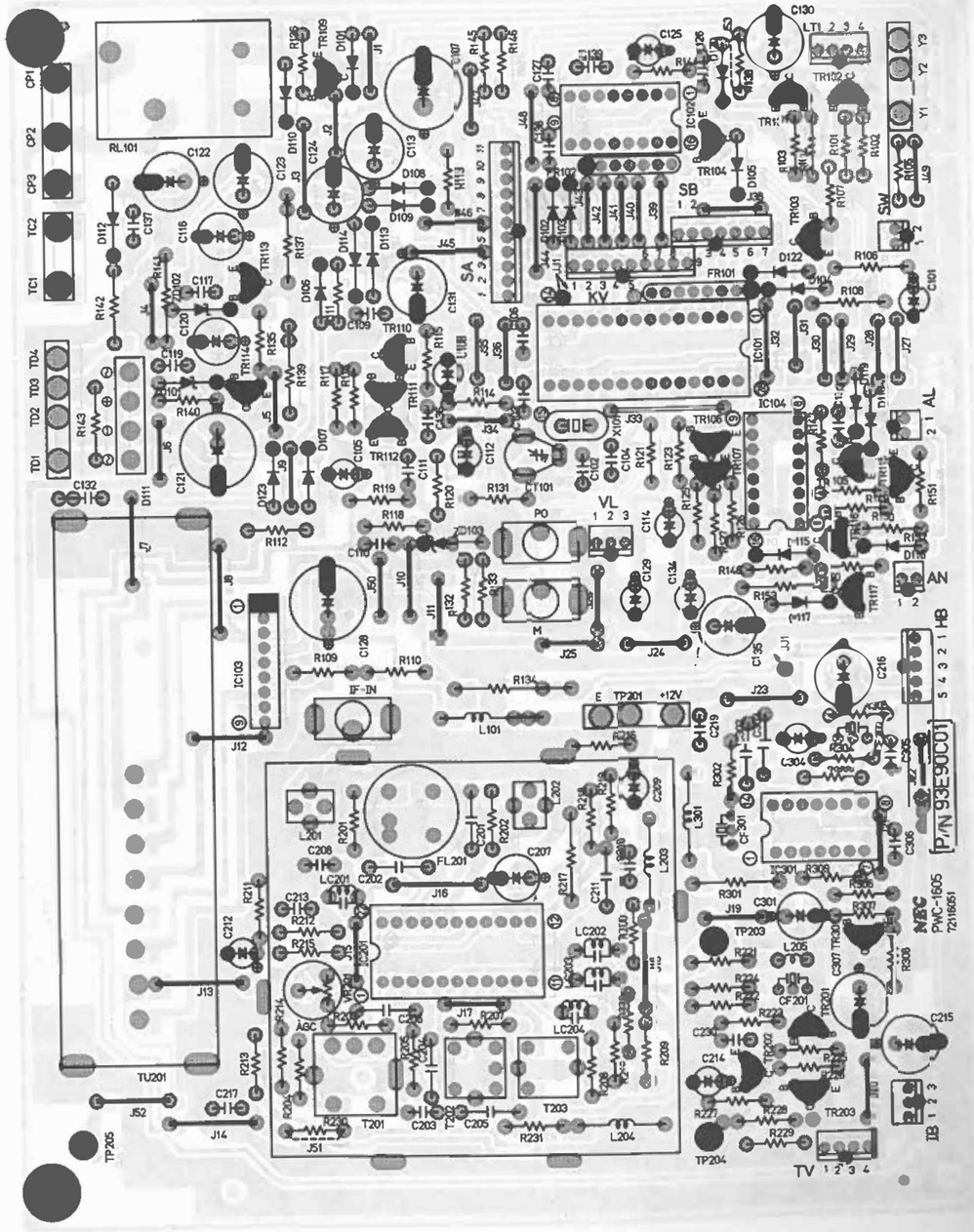
MAIN PWB (PWC-1536)
–Component Side–



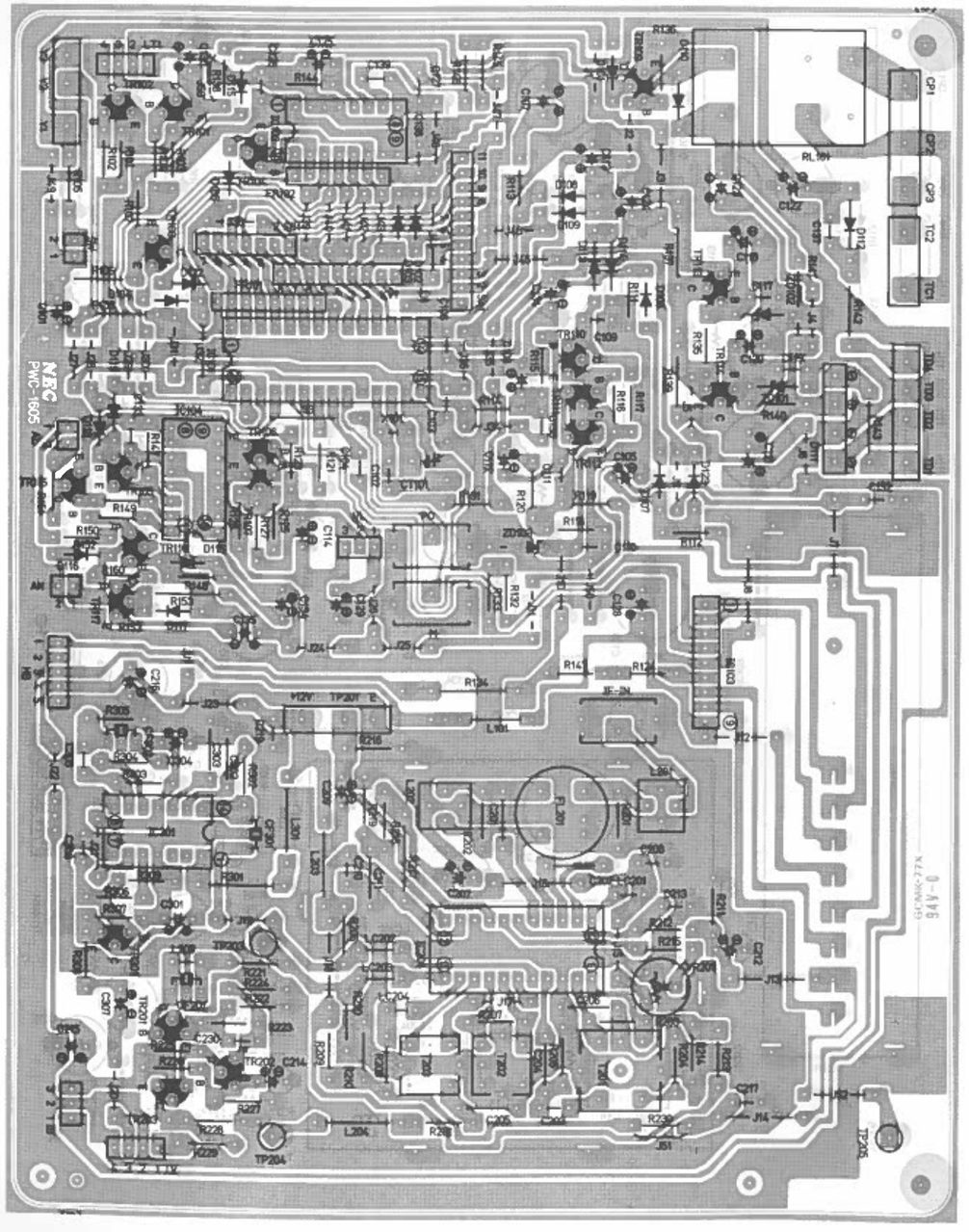
MAIN PWB (PWC-1536)
—Solder Side—



TUN-IF PWB (PWC-1605)
—Component Side—

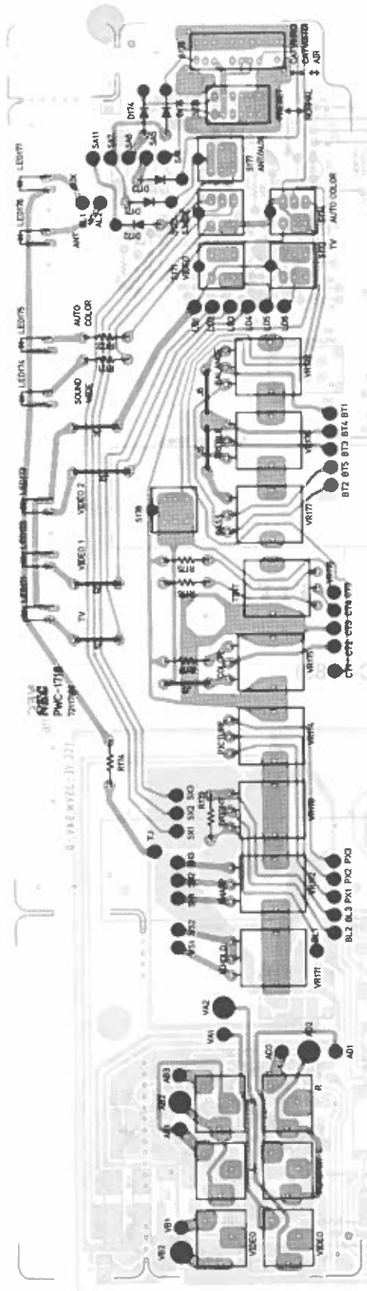


TUN-IF PWB (PWC-1605)
—Solder Side—

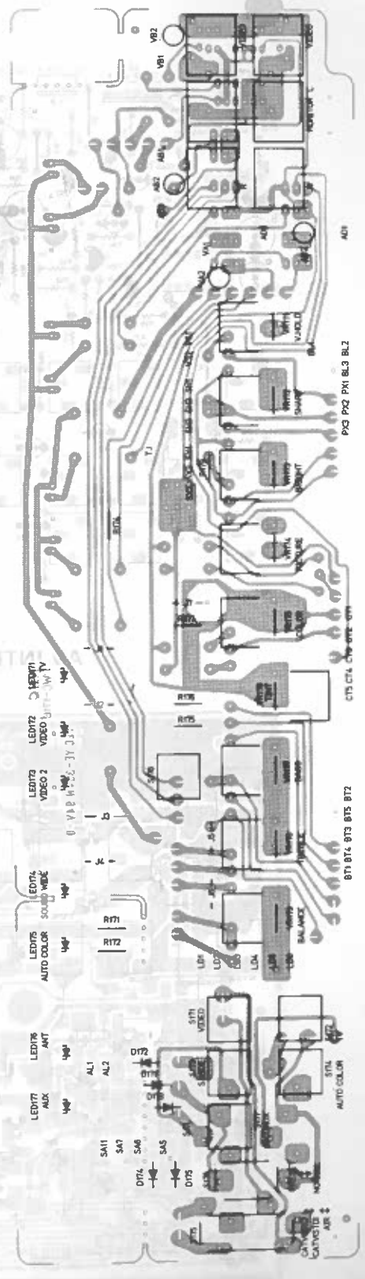


CONTROL PWB (PWC-1716)

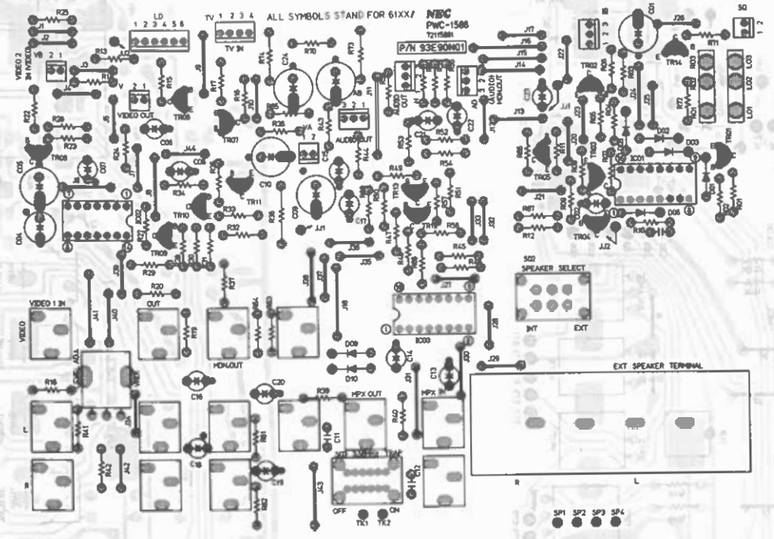
—Component Side—



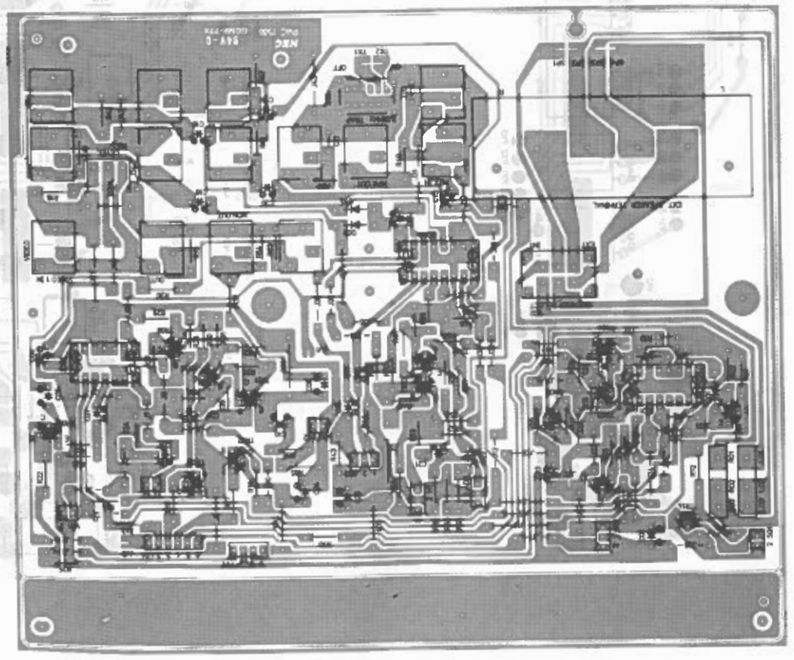
—Solder Side—



AV INTERFACE PWB (PWC-1588)
—Component Side—

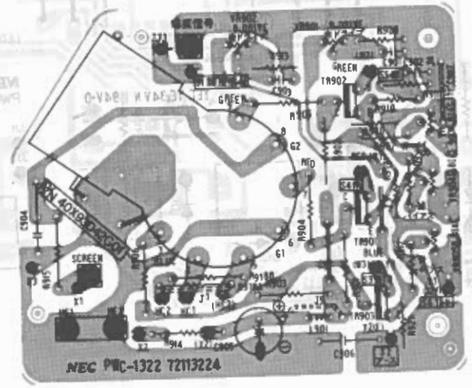


AV INTERFACE PWB (PWC-1588)
—Solder Side—

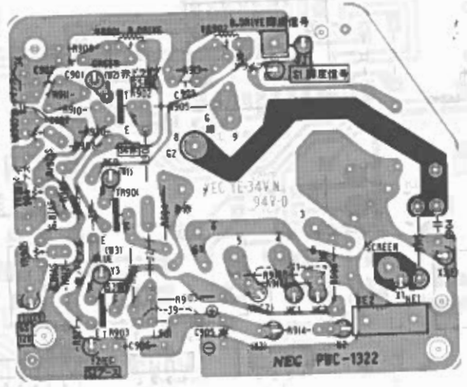


VIDEO CRT PWB (PWC-1322)

—Component Side—

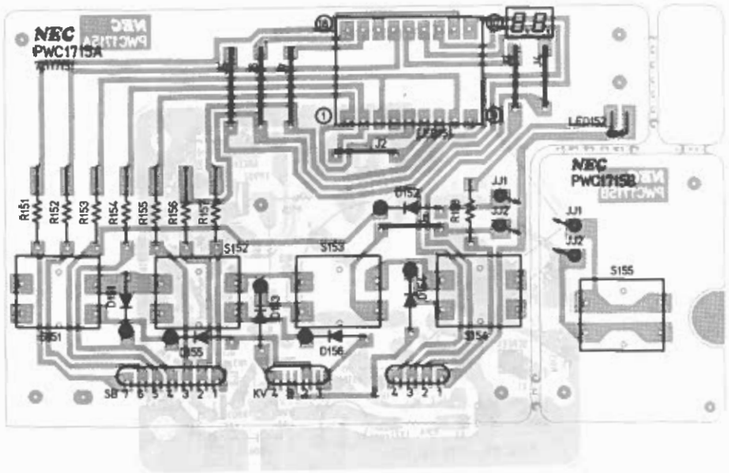


—Solder Side—

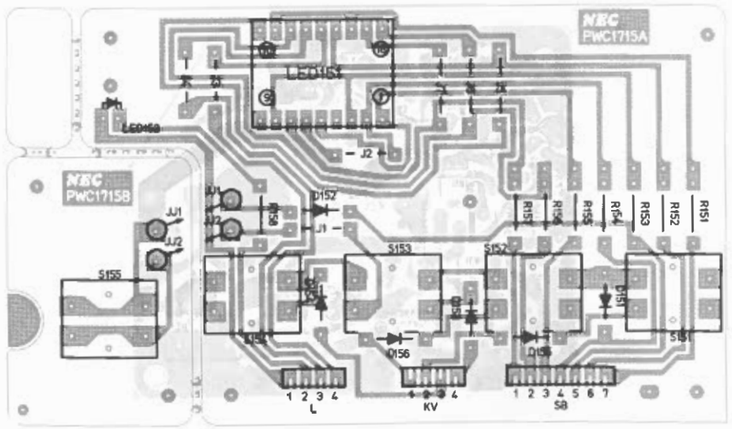


CH LED PWB (PWC-1715)

—Component Side—

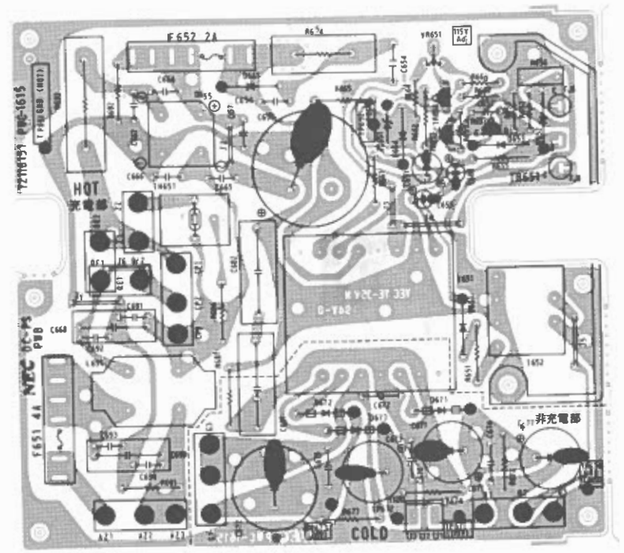


—Solder Side—

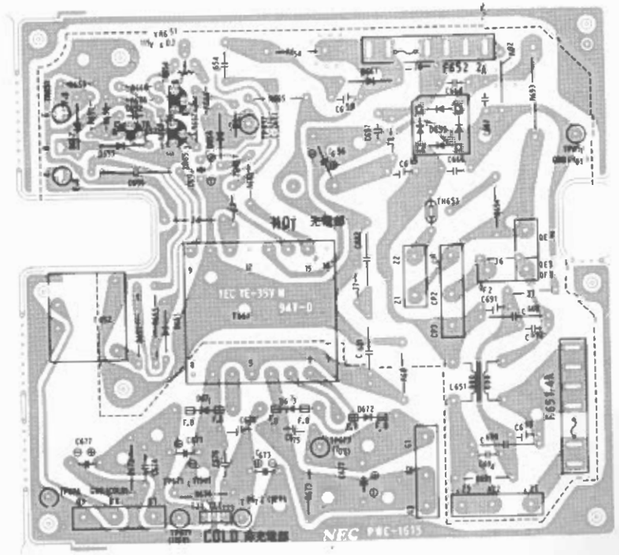


DC-PS PWB (PSC-1801)

—Component Side—



—Solder Side—



REPLACEMENT PARTS LIST (CT1901A)

Note:
1. Parts order must contain model name, parts number and description.
2. When you place order for spare parts, please refer to the respective service manual and mention the right parts number on your P.O. Sheets.
3. Standard resistors, capacitors and coils which are normally available from local electronics suppliers, are not stocked in warehouse.
4. The quantity of mentioned spare parts is per one set in this list.
5. The components identified by ⚠ mark or with the symbol Nos. shaded are critical for safety. Replace only with parts number specified.

SYMBOL	PARTS NO	DESCRIPTION	QTY
		** CRT & TUNER **	
⚠	33020101	CRT-510YWB22A-TC02(Y)	1
⚠	58635090	TUNER,CATV 134CH	1
		** ICS **	
IC301	37001034	IC MPC1382C	1
IC301	37001046	IC AN5835(DC-CONT)	1
IC302	37001047	IC AN7158N(SND)	1
IC701	37003027	IC HA11436A (CHR)	1
IC201	37007014	IC MPC1350C2	1
IC401	37009016	IC UPC1377C (HORI)	1
IC152	37011031	IC M54563P (DRIV)	1
IC103	37011039	IC LA7910 (BAND SW)	1
IC151	37011044	IC M54516P (DRIV)	1
IC6102	37051U36	MOS UPD4066BC	1
IC104	37051246	MOS UPD4027C (J-K F.F)	1
IC102	37051523	MOS UPD6250C (EAROM)	1
IC6103	37053002	MOS UPD4052BC (MPX)	1
IC6101	37053003	MOS UPD 41608C (COUNT)	1
IC101	37058002	MOS UPD1709C-511 (PLL)	1
IC153	37058003	MOS UPD652C-065 (CPU)	1
		** TRANSISTORS **	
TR501 TR6101 TR6103 TR6105 TR712 TR715 TR716 TR719 TR722	35003517	TR,2SA733/733A Q	9
TR653	35004411	TR,2SA952 K	1
TR117	35024812	TR,2SB536 L	1
TR402	35025212	TR 2SB546/546 AL	1
TR101 TR104 TR105 TR106 TR107 TR111 TR112 TR115 TR151	35047217	TR,2SC945Q	47
TR201 TR202 TR203 TR301 TR301 TR302 TR303 TR304 TR305 TR6102 TR6104 TR6106 TR6107 TR6108 TR6109 TR6110 TR6111 TR6112 TR6113 TR6114 TR652			
⚠ TR654 TR701 TR702 TR703 TR704 TR705 TR706 TR707 TR709 TR710 TR711 TR713 TR714 TR717 TR718 TR720 TR721	35047217	TR,2SC945Q	47
TR403	35053012	TR,2SC1941 L	1
TR109	35053212	TR,2SC2002 L	1
TR901 TR902 TR903	35053812	TR,2SC2371 (8) L	3
TR502	35056511	TR,2SC2688 K	1
TR114 TR401	35063412	TR,2SD401/401A L	2
TR503	35065911	TR,2SD471 K	1
TR113	35065912	TR,2SD471 L	1
TR591	35066100	TR 2SD 670	1
TR116	35067212	TR,2SD965L	1
TR651	35067300	TR,2SD1186	1
TR110	35120718	TR,2SK118 R	1
		** DIODES **	
D114	36001010	DIODE,SI.1S-2472	1
D101	36001015	DIODE,SI 1SS54	1
ZD501 ZD502	36003039	DIODE,ZENER RD12EB	2
ZD651	36003061	DIODE,ZENER,RD6.8E-B	1
⚠ ZD102 ZD201	36003106	DIODE,RD6.2EH-3	2
ZD101	36003125	DIODE,RD13EB (2)	1
ZD103	36003152	DIODE,ZENER RD33E B-4	1
D113 D151 D152	360K1015	DIODE,SI.1SS54	24

SYMBOL			PARTS NO	DESCRIPTION	QTY
		** DIODES **			
	D153	D154 D155			
	D156	D157 D171			
	D172	D173 D174			
	D175	D176 D177			
	D178	D179 D6101			
	D6102	D6103 D6105			
	D6106	D6107 D6110			
	D103	D105 D108	36GK1027	DIODE 1SS132	26
	D109	D110 D115			
	D116	D117 D118			
	D119	D120 D122			
	D123	D124 D501			
	D502	D401 D402			
	D403	D506 D701			
	D702	D703 D704			
	D705	D706			
	D405		36107086	RECTIFIER,SI.1SR35-400	1
	D112		36107094	RECTIFIER,SI SM-1A-02	1
⚠	D651	D652 D653	36107160	RECTIFIER,SI.TVR-U66	4
	D654				
	D503		36107167	RECTIFIER,SI.RM-1C	1
	D502		36107263	RECTIFIER,SI.F114E	1
	D671		36107286	RECTIFIER,SM-3-08FR	1
	D661		36107287	RECTIFIER,SI.RGP10J	1
	D672	D673	36107289	RECTIFIER,SI FE3B	2
⚠	D111		36108003	DIODE BRIDGE,RB-150	1
⚠	D655		36108009	DIODE,RB-40C BRIDGE	1
⚠	D2001	D404 D501	361K7160	RECTIFIER,SI.TVR-U66	5
	D504	D505			
	LED152		36801061	DIODE LIGHT TLR211	1
	LED171	LED172 LED173	36801081	DIODE SLR-54MT4	8
	LED174	LED175 LED176			
	LED177	LED178			
	LED151		36801097	DIODE TLG2168	1
⚠	TH651		38112013	THERMISTOR,POSITIVE	1
		** TRANSFORMERS **			
⚠	T691		45052110	POWER TRANS	1
⚠	T652		46304101	TRANS CONVERTER	1
⚠	T651		46310101	TRANSFORMER	1
	T501		46399001	TRANS H DRIVE	1
⚠	T502		47105103	F.B.T	1
		** VARIABLE RESISTORS **			
	VR174		41023401	R,VARIABLE 10K	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
		** VARIABLE RESISTORS **			
	VR172	VR173	41023402	R,VARIABLE 1K	2
	VR175	VR176 VR177	41023403	R,VARIABLE 10K	5
	VR178	VR179			
	VR171		41023404	R,VARIABLE 5K	1
	VR6101		41023451	R,VARIABLE 1K	1
	VR351		41061014	R,VARIABLE 2.2K	1
	VR401	VR701	41061505	R,VARIABLE 470K 0.15W	2
	VR501	VR702	41061511	R,VARIABLE 4.7K	2
	VR201		41061513	R,VARIABLE 10K 0.15W	1
	VR102	VR161	41071115	R,VARIABLE 10K	2
	VR901	VR902	41086302	R,VARIABLE 200H	2
	VR903	VR904 VR905	41086307	R,VARIABLE 3K 0.1W	3
⚠	VR651		41505004	R,VARABLE 1K	1
⚠	VR2001		41505008	R,VARIABLE 10K 0.1W	1
		** SWITCHES **			
	S6102		65113012	SWITCH,SLIDE	1
	S180		65199016	SWITCH SLIDE	1
	S181		65199017	SWITCH SLIDE	1
	S6103		65199018	SW,SLID	1
⚠	S691		65208104	SEESAW SWITCH	1
	S151	S152 S153	65361002	SWITCH,PUSH BUTTON	4
	S154				
	S177	S178 S179	65361005	SWICH PUSH	3
	S155		65361010	SW,PUSH	1
	S173	S174 S176	65399032	SWITCH PUSH	4
	S182				
	S171	S172 S175	65399033	SWITCH PUSH	4
	S183				
⚠	RL101		65602021	RELAY G4W-1112P-US-TV8-P	1
		** PWB ASSY **			
			93E90C01	TUN-IF PWB ASSY	1
			93E90F01	MAIN PWB ASSY	1
			93E90G01	VIDEO CRT PWB ASSY	1
			93E90H01	PHONE-JACK PWB ASSY	1
			93E90M01	CONTROL PWB ASSY	1
			93E90N01	AV-INT PWB ASSY	1
			93E90T01	CH-TIME LED PWB ASSY	1
			93E90W01	DC-PS PWB ASSY	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
		** MISCELLANEOUS PARTS **			
	LC201	LC202 LC203	39021001	COIL,TRAP 177MHZ	4
	LC204				
	RR153		39030004	R,NETWORK1/8W 7X100KM	1
	RR102		39030008	R,NETWORK 1/8W 5X10KM	1
	RR101		39030019	R,NETWORK R1/8W 7X10KM	1
	RR152		39030039	R,NETWORK 4X33KM	1
	CT101		44208007	CERAMIC 18P	1
			63010204	SPEAKER 12cmX7cmP 16Ω 3W	2
	X701		64003011	X-TAL 3.579MHZ	1
	X101		64003012	CRYSTAL 4.5MHZ	1
	S401		66099003	LEVER SWITCH	1
⚠	F651		66651403	FUSE 4A T 125V UL 5UMM	1
⚠	F652		66651404	FUSE 2A	1
		⚠	70032052	SG/CRT SOCKET	1
			70051052	PIN JACK	3
			70051075	PIN JACK 1P	2
			70051091	PIN JACK 1P (R)	6
			70051092	PIN JACK 1P (W)	6
			70051093	PIN JACK 1P (Y)	6
			70101015	SOCKET,TR	2
			70102001	SOCKET,IC 14PIN	1
			70102002	SOCKET,IC 16PIN	2
			70102010	SOCKET,IC 28PIN	1
			70102019	IC SOCKET 22P	2
			70505025	EARPHONE JACK	1
			70507008	JACK,HEADPHONE	1
			70541021	OCTAL PIN (A)	63
		⚠	70699003	LINE CORD SPT-2	1
		⚠	71110907	MATCHING BOX,300-75FF	1
		⚠	71121871	TARMINAL ANTENNA (UL)	1
			71205030	HOLDER,FUSE	4
			79602921	PHOTO SENS UNIT	1
			79603561	REMOT HANDUNIT	1
		** APPEARANCE PARTS **			
			24320661	CABINET BACK	1
			24469751	BUTTON PUSH D	7
		** COILS & FILTERS **			
	T201		60245030	V.IFT 2ND	1
	T202		60255021	V.IFT P.SET	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
		** COILS & FILTERS **			
	T203		60253021	V.IFT AFT	1
	L703		60351003	COIL,TRAP 5.5MHZ	1
	T701		60565014	COIL D.L	1
⚠	L505		60917038	COIL H.LTN	1
	L201		61011042	COIL (B) 1R7	1
	L202		61011048	COIL (B) 1R4	1
	L709		61013015	COIL,FILTER 15UH	1
	L205		61051517	COIL,FILTER	1
	L20		61051519	COIL,FILTER 15UH	1
	L901		61051530	COIL,FILTER 120UH	1
⚠	L651		61062014	COIL,LINE FILTER	1
	L506		61064006	COIL FILTER 50UH	1
	L501	L504	61064055	COIL,FILTER 4.7UH	2
	L102		61066014	COIL,FILTER 5.6UH	1
	L101	L203 L204	61067118	COIL,FILTER 12UH	4
	L301				
	L705		610E1717	COIL,FILTER 10UHA,T (S)	1
	L704		610E1725	COIL,FILTER 47UHA,T (S)	1
	L702		610E1727	COIL,FILTER 68UHA,T (S)	1
	L701		610E1730	COIL,FILTER 120UHA,T (S)	1
	L502		610F6014	COIL,FILTER 5.6UH	1
	CF301		61105011	COIL,FILTER 4.5MHZ	1
	CF201		61107004	CERAMIC TRAP 4.5MHZ	1
	CF151		61111009	CERAMIC RESONATOR	1
	CF302		61112011	CERAMIC DISCRIMINATOR	1
	FL201		61120052	VIF SAWF SAF45MH	1
		⚠	61320105	COIL,DEGAUSSING	1
	DL701		61511051	DELAY LINE	1
			61605005	FERRITE BEAD	10
		** PACKING MATERIALS **			
			24826021	FILLER CARTON A	1
			24826031	FILLER CARTON B	1
			24826921	CARTON BOX	1
			78051291	INSTRUCTION BOOK (CT1901)	1
		** RESISTORS **			
⚠	R662	R904 R905	40003042	R,SOLID 2.7K 10% 1/2W	4
	R906				
	R673	R674	40003047	R,SOLID 6.8K 10% 1/2W	2
	R665	R672 R692	40003065	R,SOLID 220K 10% 1/2W	3
⚠	R691		40003073	R,SOLID 1.0M 10% 1/2W	1

SYMBOL	PARTS NO	DESCRIPTION	QTY
** RESISTORS **			
R6993 R6994	40003145	R/SOLID 68H 5% 1/2W	2
R6991 R6992	40003159	R/SOLID 270H 5% 1/2W	2
R519	40003561	R/SOLID 100K 10% 1/2W	1
⚠ R681	40023077	R/SOLID 2.2M 10% 1/2W	1
R301	400K3525	R/SOLID 100H 10% 1/2W	1
R217	400K3526	R/SOLID 120H 10% 1/2W	1
R228 R6136	400K3529	R/SOLID 220H 10% 1/2W	2
R414	400K3536	R/SOLID 820H 10% 1/2W	1
R527	400K3537	R/SOLID 1.0K 10% 1/2W	1
R418	400K3540	R/SOLID 1.8K 10% 1/2W	1
R515	400K3545	R/SOLID 4.7K 10% 1/2W	1
R229	40136137	R/CARBON 33H 5% 1/4W	1
R6119 R6120 R6124	40136146	R/CARBON 75H 5% 1/4W	5
R6137 R6138			
R174 R910	40136149	R/CARBON 100H 5% 1/4W	2
R660 R908 R911	40136153	R/CARBON 150H 5% 1/4W	4
R913			
R151 R152 R153	40136159	R/CARBON 270H 5% 1/4W	10
R154 R155 R156			
R157 R164 R165			
R166			
R656	40136167	R/CARBON 560H 5% 1/4W	1
R158 R161 R2	40136173	R/CARBON 1.0K 5% 1/4W	3
R171 R172 R173	40136175	R/CARBON 1.2K 5% 1/4W	3
R657	40136177	R/CARBON 1.5K 5% 1/4W	1
⚠ R664	40136179	R/CARBON 1.8K 5% 1/4W	1
R175	40136181	R/CARBON 2.2K 5% 1/4W	1
R907 R909 R912	40136183	R/CARBON 2.7K 5% 1/4W	3
⚠ R663	40136191	R/CARBON 5.6K 5% 1/4W	1
R162 R163	40136197	R/CARBON 10K 5% 1/4W	2
R659	40136199	R/CARBON 12K 5% 1/4W	1
R160	40136213	R/CARBON 47K 5% 1/4W	1
R159	40136239	R/CARBON 560K 5% 1/4W	1
R161	40136673	R/CARBON 1.0K 5% 1/4W	1
R101	40136867	R/CARBON 3.9K 5% 1/4W	1
R223	40146169	R/CARBON 680H 5% 1/4W	1
⚠ R143	40177101	R/CARBON 1H 5% 1/4W	1
R520	40177173	R/CARBON 1.0K 5% 1/4W	1
⚠ R523	40178101	R/CARBON 1H 5% 1/2W	1
R6122 R6174	401C6625	R/CARBON 10H 5% 1/4W	2
R6130	401C6637	R/CARBON 33H 5% 1/4W	1
R204	401C6641	R/CARBON 47H 5% 1/4W	1
R113 R127 R308	401C6649	R/CARBON 100H 5% 1/4W	3
R6123 R6126	401C6651	R/CARBON 120H 5% 1/4W	2
R213 R304	401C6659	R/CARBON 270H 5% 1/4W	2

SYMBOL	PARTS NO	DESCRIPTION	QTY
** RESISTORS **			
R221 R305 R6131	401C6661	R/CARBON 330H 5%1/4W	2
	401C6663	R/CARBON 390H 5% 1/4W	1
⚠ R205 R6132 R6173	401C6665	R/CARBON 470H 5% 1/4W	3
R206	401C6667	R/CARBON 560H 5% 1/4W	1
R140	401C6669	R/CARBON 680H 5% 1/4W	1
R112 R114 R115	401C6673	R/CARBON 1.0K 5% 1/4W	23
R125 R135 R151			
R152 R202 R208			
R215 R222 R224			
R225 R231 R302			
R306 R6118 R6129			
R6133 R6167 R6168			
R6169 R6170			
R109 R6113 R6115 R6117	401C6677	R/CARBON 1.5K 5% 1/4W	4
R110 R207 R212 R214 R219	401C6679	R/CARBON 1.8K 5% 1/4W	5
R145 R149 R150 R160 R220 R307 R309	401C6681	R/CARBON 2.2K 5% 1/4W	7
R146 R203 R6139 R6140	401C6683	R/CARBON 2.7K 5% 1/4W	4
R119 R120 R201 R227 R6128 R6134	401C6685	R/CARBON 3.3K 5% 1/4W	6
R218 R303	401C6687	R/CARBON 3.9K 5% 1/4W	2
R123 R131 R6101 R6109 R6114 R6116 R6157 R6158 R6171 R6172	401C6689	R/CARBON 4.7K 5% 1/4W	10
R6127	401C6691	R/CARBON 5.6K 5% 1/4W	1
R211	401C6693	R/CARBON 6.8K 5% 1/4W	1
R6135	401C6695	R/CARBON 8.2K 5% 1/4W	1
R117 R118 R132 R133 R136 R226 R6104 R6105 R6106 R6107 R6110 R6112	401C6697	R/CARBON 10K 5% 1/4W	19
R6151 R6152 R6153 R6154 R6155 R6156 R6166	401C6697	R/CARBON 10K 5% 1/4W	19
R121	401C6701	R/CARBON 15K 5% 1/4W	1
R101 R103 R147 R148 R6103 R6108 R6111	401C6705	R/CARBON 22K 5% 1/4W	7
R6102	401C6709	R/CARBON 33K 5% 1/4W	1
R116	401C6711	R/CARBON 39K 5%	1
R111 R209 R210 R108 R6125 R6141 R6142 R6143 R6144 R6145 R6146 R6147	401C6719	R/CARBON 82K 5% 1/4W	3
	401C6721	R/CARBON 100K 5% 1/4W	17

SYMBOL	PARTS NO	DESCRIPTION	QTY
** RESISTORS **			
R6149 R6159 R6160 R6161 R6162 R6163 R6164 R6165			
R6148 R6150	401C6723	R/CARBON 120K 5% 1/4W	2
R144	401C6725	R/CARBON 150K 5% 1/4W	1
R216	401C6737	R/CARBON 470K 5%	1
R511	401K2663	R/CARBON 390H 5% 1/3W	1
R425	401K2679	R/CARBON 1.8K 5% 1/3W	1
R423	401K2687	R/CARBON 3.9K 5% 1/3W	1
R422	401K5613	R/CARBON 3.3H 5% 1/6W	1
R413	401K5631	R/CARBON 18H 5% 1/6W	1
R708	401K5641	R/CARBON 47H 5% 1/6W	1
R410	401K5643	R/CARBON 56H 5% 1/6W	1
R362 R365 R421 R766	401K5649	R/CARBON 100H 5% 1/6W	4
R727	401K5651	R/CARBON 120H 5% 1/6W	1
R330 R352 R354 R356	401K5653	R/CARBON 150H 5% 1/6W	4
R408 R753	401K5655	R/CARBON 180H 5% 1/6W	2
R331 R349 R351	401K5657	R/CARBON 220H 5% 1/6W	3
R512 R514 R715 R716 R775 R777 R779	401K5661	R/CARBON 330H 5% 1/6W	7
R726 R730 R531	401K5663	R/CARBON 390H 5% 1/6W	2
	401K5664	R/CARBON 430H 5% 1/6W	1
R734 R790 R515 R711 R713 R714 R721 R781	401K5665	R/CARBON 470H 5% 1/6W	2
	401K5667	R/CARBON 560H 5% 1/6W	6
R707 R705 R706 R794	401K5669	R/CARBON 680H 5% 1/6W	2
	401K5671	R/CARBON 820H 5% 1/6W	2
⚠ R2001 R339 R343 R348 R357 R704 R705 R720 R723 R729 R732 R746 R747 R768	401K5673	R/CARBON 1K 5% 1/6W	14
R728 R789	401K5675	R/CARBON 1.2K 5% 1/6W	2
R717 R731 R767 R795 R797	401K5677	R/CARBON 1.5K 5% 1/6W	5
R706 R755	401K5679	R/CARBON 1.6K 5% 1/6W	2
R340 R709 R748 R784 R785	401K5681	R/CARBON 2.2K 5% 1/6W	5
R341 R506	401K5683	R/CARBON 2.7K 5% 1/6W	2
R510 R736 R774 R776 R778 R787	401K5685	R/CARBON 3.3K 5% 1/6W	6
R101 R358 R359 R361 R364 R409 R507 R743	401K5689	R/CARBON 4.7K 5% 1/6W	8
R332 R353 R355	401K5691	R/CARBON 5.6K 5% 1/6W	11

SYMBOL	PARTS NO	DESCRIPTION	QTY
** RESISTORS **			
R404 R406 R738 R749 R750 R758 R773 R791			
⚠ R405 R419 R503 R712 R782	401K5693	R/CARBON 6.8K 5% 1/6W	5
R350 R742 R761 R338 R342 R367 R369 R407 R509 R719 R724 R725 R750 R751 R752 R754 R757 R762 R765 R769 R771 R772	401K5695	R/CARBON 8.2K 5% 1/6W	3
	401K5697	R/CARBON 10K 5% 1/6W	19
R505 R739	401K5699	R/CARBON 12K 5% 1/6W	2
⚠ R2002 R703	401K5701	R/CARBON 15K 5% 1/6W	2
R360 R363 R710	401K5703	R/CARBON 18K 5% 1/6W	3
R411 R520 R718 R724B R753 R412	401K5705	R/CARBON 22K 5% 1/6W	5
	401K5706	R/CARBON 24K 5% 1/6W	1
R334 R702 R793 R796	401K5707	R/CARBON 27K 5% 1/6W	4
R420 R502	401K5709	R/CARBON 33K 5% 1/6W	2
R337 R344 R346 R526 R740	401K5711	R/CARBON 39K 5% 1/6W	5
R345 R347 R403 R506 R529 R701	401K5713	R/CARBON 47K 5% 1/6W	8
R737 R759 R760 R504	401K5713	R/CARBON 47K 5% 1/6W	8
	401K5715	R/CARBON 56K 5% 1/6W	1
	401K5717	R/CARBON 68K 5% 1/6W	1
R535 R741	401K5719	R/CARBON 82K 5% 1/6W	2
R333 R336 R735 R764 R792	401K5721	R/CARBON 100K 5% 1/6W	5
R770 R783 R788	401K5729	R/CARBON 220K 5% 1/6W	2
	401K5737	R/CARBON 470K 5% 1/6W	1
R693	40216038	R/WIRE 1.5H 10% 7W	1
R654	40318053	R/METAL 22K 10% 5W	1
R153	40351147	R/METAL 82H 5% 1W	1
R139	40351151	R/METAL 120H 5% 1W	1
R137 R141	40351155	R/METAL 180H 5% 1W	2
R901 R902 R903	40351201	R/METAL 15K 5% 1W	3
R541	40352117	R/METAL 4.7H 5% 2W	1
R655	40352125	R/METAL 10H 5% 2W	1
R651	40352127	R/METAL 12H 5% 2W	1
R134	40352191	R/METAL 5.6K 5% 2W	1
R424	40371153	R/METAL 22H 5% 1W	1
R532	40372125	R/METAL 10H 5% 2W	1
R525	40372155	R/METAL 180H 5% 2W	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
				** RESISTORS **	
R415			40372185	R/METAL 3.3K 5% 2W	1
R516			40372189	R/METAL 4.7K 5% 2W	1
R501			40372197	R/METAL 10K 5% 2W	1
⚠ R142	R2003	R518	40405109	R/METAL 2.2M 5% 1/4W	4
⚠ R524					
⚠ R300	R368	R517	40405117	R/METAL 4.7M 5% 1/4W	3
⚠ R401	R722	R744	40405125	R/METAL 10M 5% 1/4W	3
⚠ R370			40405141	R/METAL 47M 5% 1/4W	1
R661			40405143	R/METAL 56M 5% 1/4W	1
R656			40499002	R/METAL 1.0M 5% 2W	1
				** CAPACITORS **	
C657	C674	C906	4201J575	C/CERAMIC 500V 0.01UF	3
C904			42022113	C/CERAMIC 1KV 100PF	1
C413			4203J556	C/CERAMIC 500V 27PF	1
C905			4203J563	C/CERAMIC 50V 1000PF	1
C415	C512		4203J575	C/CERAMIC 500V 0.01UF	2
⚠ C664	C665	C667	42099029	C/CERAMIC 125V 4700PF	4
⚠ C667			42099029	C/CERAMIC 125V 4700PF	4
C659			42099060	C/CERAMIC 500V 1000PF	1
C511			4209560	C/CERAMIC 500V 560PF	1
⚠ C416	C514	C518	4209567	C/CERAMIC 500V 2200PF	5
C519	C524				
C901	C902	C903	42130213	C/CERAMIC 50V 1000PF	3
C713			4213K207	C/CERMIC 50V 330PF	1
C739			4213K215	C/CERMIC 50V 1500PF	1
C208	C210	C213	4213K217	C/CERMIC 50V 2200PF	3
C219			4213K225	C/CERAMIC 50V 0.01UF	1
C217	C304		4219J002	C/CERAMIC 50V 0.1UF	2
C404	C509	C723	421C0213	C/CERAMIC 50V 1000PF	3
C711	C729	C731	421C0225	C/CERAMIC 50V 0.01UF	4
C745					
C205	C206	C302	421C1025	C/CERAMIC 25V 0.01UF	4
C303					
C201	C202	C204	421C1067	C/CERAMIC 50V 2200PF	4
C211					
C709			4231A049	C/CERAMIC 50V 150PF	1
C420			4231A053	C/CERAMIC 50V 220PF	1
C203			4231B023	C/CERAMIC 50V 12PF	1
C717			4231B037	C/CERAMIC 50V 47PF	1
C738			4231B045	C/CERAMIC 50V 100PF	1
C732			4231B063	C/CERAMIC 50V 18PF	1
C748			4231B064	C/CERAMIC 50V 20PF	1
C747			4231B067	C/CERAMIC 50V 27PF	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
				** CAPACITORS **	
C750			4231B069	C/CERAMIC 50V 33PF	1
C746			4231B071	C/CERAMIC 50V 39PF	1
C153	C305		4231B075	C/CERAMIC 50V 56PF	2
C102			4231B076	C/CERAMIC 50V 62PF	1
C154			4231B079	C/CERAMIC 50V 82PF	1
C2			4231B081	C/CERAMIC 50V 100PF	1
C250			42331045	C/CERAMIC 50V 100PF	1
C702	C703	C708	423A1033	C/CERAMIC 50V 33PF	4
C710					
C349	C354	C724	423A1045	C/CERAMIC 50V 100PF	4
C752					
C733	C734	C735	423A1051	C/CERAMIC 50V 180PF	3
C419			42703565	C/FILM 200V 0.015UF	1
C563			42703669	C/FILM 400V 0.033UF	1
C654			42754409	C/FILM 400V 0.022UF	1
C6111	C6112		42756119	C/FILM 50V 0.033UF	2
C402			4275D002	C/FILM 50V 1500PF	1
C103	C104	C106	4275D007	C/FILM 50V 0.01UF	10
C109	C110	C126			
C133	C151	C152			
C704					
C406			4275D012	C/FILM 50V 0.068UF	1
C508			4275D051	C/FILM 50V 1000PF	1
C306	C352	C357	4275D053	C/FILM 50V 1500PF	3
C504			4275D059	C/FILM 50V 4700PF	1
C503	C652		4275D060	C/FILM 50V 5600PF	2
C127	C139	C401	4275D063	C/FILM 50V 0.01UF	3
C350	C355		4275D069	C/FILM 50V 0.033UF	2
C111			4275F117	C/FILM 50V 0.022UF	1
C507	C749		4275F119	C/FILM 50V 0.033UF	2
C506			4275F121	C/FILM 50V 47000PF	1
C359	C360	C675	4275F125	C/FILM 50V 0.1UF	5
C676	C678				
C407	C408		427E6010	C/FILM 50V 0.033UF	2
C513			42808058	C/METAL FILM 1.6KV 9000PF	1
⚠ C681	C682		42813013	C/METAL FILM 250V 0.01UF	2
C517			42839022	C/METAL FILM 250V 0.1UF	1
⚠ C668	C669		42899022	C/METAL FILM 150V 0.047UF	2
⚠ C523			42899044	C/METAL FILM 400V 0.68UF	1
C655			42899046	C/METAL FILM 100V 2.2UF	1
C526			4300E127	C/ELEC 160V 100UF	1
C673			43019033	C/ELEC 16V 1000UF	1
C303			43019055	C/ELEC 16V 3300UF	1
C101			43019060	C/ELEC 50V 0.47UF	1
C105	C332		43010099	C/ELEC 50V 0.1UF	2

SYMBOL			PARTS NO	DESCRIPTION	QTY
				** CAPACITORS **	
C125	C209		4301D103	C/ELEC 50V 0.47UF	2
C6102	C6123		4301D105	C/ELEC 50V 1UF	2
C112			4301D107	C/ELEC 50V 2.2UF	1
C6105	C6109	C6110	4301J019	C/ELEC 10V 4700UF	3
C113	C116	C120	4301J025	C/ELEC 16V 100UF	18
C124	C214	C304			
C6108	C6113	C6114			
C6115	C6116	C6117			
C6118	C6119	C6120			
C6121	C6122	C753			
C207	C301	C6104	4301J028	C/ELEC 16V 47UF	5
C6106	C6107				
C114	C131	C215	4301J029	C/ELEC 16V100UF	4
C307			4301J029	C/ELEC 16V100UF	4
C123	C135		4301J030	C/ELEC 16V220UF	2
C216	C361	C362	4301J032	C/ELEC 16V 470UF	10
C409	C522	C527			
C6101	C6124	C6125			
C730					
C715			4301J033	C/ELEC 16V 1000UF	1
C521			4301J044	C/ELEC 25V 330UF	1
C128			4301J045	C/ELEC 25V 470UF	1
C121			4301J046	C/ELEC 25V 1000UF	1
C418			4301J055	C/ELEC 35V 220UF	1
C134	C155		4301J061	C/ELEC 50V 1UF	2
C212			4301J064	C/ELEC 50V 4.7UF	1
C651			4301J065	C/ELEC 50V 10UF	1
C122			4301J069	C/ELEC 50V 100UF	1
C417			4301J101	C/ELEC 100V 47UF	1
C107			43099063	C/ELEC 5V 47000UF	1
C515	C516	C520	4309J040	C/ELEC 160V 10UF	3
C414			4309J056	C/ELEC 500V 2.2UF	1
C671	C677		4309J064	C/ELEC 160V 100UF	2
C339	C342	C510	430A4101	C/ELEC 50V 0.22UF	3
C334			430A4103	C/ELEC 50V 0.47UF	1
C741			430A4105	C/ELEC 50V 1UF	1
C501			430A5036	C/ELEC 16V 100UF	1
C348	C351	C356	430A5052	C/ELEC 25V 1000UF	3
⚠ C2001	C331	C340	430A9025	C/ELEC 16V 10UF	16
C341	C343	C403			
C525	C701	C705			
C706	C710	C719			
C737	C743	C744			
C751					
C353	C354		430A9027	C/ELEC 16V 33UF	2
C355	C358	C712	430A9028	C/ELEC 16V 47UF	5
C714	C716				

SYMBOL			PARTS NO	DESCRIPTION	QTY
				** CAPACITORS **	
C720	C727		430A9037	C/ELEC 25V 10UF	2
C412			430A9038	C/ELEC 25V 10UF	1
C337	C338	C410	430A9061	C/ELEC 50V 1UF	5
C721	C725				
C505			430A9062	C/ELEC 50V 2.2UF	1
C344	C345	C502	430A9063	C/ELEC 50V 3.3UF	7
C707	C726	C728			
C742					
⚠ C2002	C722		430A9065	C/ELEC 50V 10UF	2
C672			43104036	C/ELEC 25V 2200UF	1
C656			43104078	C/ELEC 200W 6800UF	1
C335	C336		433A1023	C/ELEC 25V 100F	2
C108			43515065	C/TANTALUM 35V 0.1UF	1
C411			435A5055	C/TANTALUM 16V 10UF	1
C405			435A5071	C/TANTALUM 35V 1UF	1

REPLACEMENT PARTS LIST (CT2501A)

Note:

1. Parts order must contain model name, parts number and description.
2. When you place order for spare parts, please refer to the respective service manual and mention the right parts number on your P.O. Sheets.
3. Standard resistors, capacitors and coils which are normally available from local electronics suppliers, are not stocked in warehouse.
4. The quantity of mentioned spare parts is per one set in this list.
5. The components identified by ⚠ mark or with the symbol Nos. shaded are critical for safety. Replace only with parts number specified.

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** CRT & TUNER ***			
⚠	33025033	CRT-670DRB22-TC04(T)	1
⚠	5863509D	TUNER,CATV 134CH	1
*** ICS ***			
IC301	37001034	IC MPC1382C	1
IC301	37001046	IC AN5835(DC-CONT)	1
IC302	37001047	IC AN7158N(SND)	1
IC701	37003027	IC HA11436A (CHR)	1
IC201	37007014	IC MPC1356C2	1
IC401	37009016	IC UPC1377C (HORI)	1
IC152	37011031	IC M54563P (DRIV)	1
IC103	37011039	IC LA7910 (BAND SW)	1
IC151	37011044	IC M54516P (DRIV)	1
IC6102	37051036	MOS UPD4066BC	1
IC104	37051246	MOS UPD4027C (J-K F.F)	1
IC102	37051523	MOS UPD6250C (EAROM)	1
IC6103	37053002	MOS UPD4052BC (MPX)	1
IC6101	37053003	MOS UPD 4160BC (COUNT)	1
IC101	37058002	MOS UPD1709C-511 (PLL)	1
IC153	37058003	MOS UPD652C-065 (CPU)	1
*** TRANSISTOR ***			
TR501 TR6101 TR6103 TR6105 TR712 TR715 TR716 TR719 TR722 TR653 TR117 TR402	35003517	TR,2SA733/733A Q	9
TR	35004411	TR,2SA952 K	1
TR104 TR105 TR106 TR107 TR111 TR112 TR115 TR151 TR201 TR202 TR203 TR301 TR302 TR303	35024812	TR,2SB536 L	1
	35025212	TR 2SB546/546 AL	1
	35047217	TR,2SC945Q	46

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** TRANSISTOR ***			
TR304 TR305 TR6102 TR6104 TR6106 TR6107 TR6108 TR6109 TR6110 TR6111 TR6112 TR6113 ⚠TR6114 TR652 TR654 TR701 TR702 TR703 TR704 TR705 TR706 TR707 TR709 TR710 TR711 TR713 TR714 TR717 TR718 TR720 TR721 TR403 TR109 TR901 TR902 TR903 TR502 TR503 TR114 TR401 TR113 TR591 TR116 TR651 TR110	35053012	TR,2SC1941 L	1
	35053212	TR,2SC2002 L	1
	35053812	TR,2SC2371 (1)	3
	35056311	TR,2SC2688 K	1
	35063411	TR,2SD401/401A K	1
	35063412	TR,2SD401/401A L	2
	35065912	TR,2SD471 L	1
	35066100	TR 2SD 870	1
	35067212	TR,2SD985L	1
	35067300	TR,2SD1186	1
	35120718	TR,2SK118 R	1
*** DIODES ***			
D113 D151 D152 D153 D154 D155 D156 D157 D171 D172 D173 D174 D175 D176 D177 D178 D179 D6101 D6102 D6103 D6105 D6106 D6109 D6110	360K1015	DIODE,SI.1SS54	24
D103 D105 D108 D109 D110 D115 D116 D117 D118 D119 D120 D122 D123 D124 D301	360K1027	DIODE 1SS132	27

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** DIODES ***			
D302 D401 D402			
D403 D506 D507			
D701 D702 D703			
D704 D705 D706			
D114 D125 D126	36001010	DIODE,SI.1S-2472	3
D	36001015	DIODE,SI 1SS54	1
ZD101 ZD501 ZD502	36003039	DIODE,ZENER RD12EB	3
ZD651	36003061	DIODE,ZENER.RD6.8E-B	1
⚠ZD102 ZD2001	36003106	DIODE,RD6.2EB-3	2
ZD	36003124	DIODE RD8.2EB(3)	1
ZD103	36003152	DIODE,ZENER RD33E B-4	1
ZD104 ZD105 ZD106	36003157	DIODE 5.1EB (3)	6
ZD107 ZD108 ZD109			
⚠D2001 D404 D501	361K7160	RECTIFIER,SI.TVR-06G	5
D504 D505			
D405	36107086	RECTIFIER,SI.1SR35-400	1
D112	36107094	RECTIFIER,SI SM-1A-02	1
⚠D651 D652 D653	36107160	RECTIFIER,SI.TVR-06G	4
D654			
D503	36107167	RECTIFIER,SI.RH-1C	1
D502	36107263	RECTIFIER,SI.F114E	1
D671	36107286	RECTIFIER,SM-3-08FR	1
D661	36107287	RECTFIER,SI.RGP10J	1
D672 D673	36107289	RECTIFIER,SI FE3B	2
⚠D111	36108003	DIODE BRIDGE,RB-150	1
⚠D655	36108009	DIODE,RB-40C BRIDGE	1
LED152	36801061	DIODE LIGHT TLR211	1
LED171 LED172 LED173	36801021	DIODE SLR-54MT4	8
LED174 LED175 LED176			
LED177 LED178			
LED151	36801097	DIODE TLG2168	1
⚠TH651	38112013	THERMISTOR,POSITIVE	1
*** TRANSFORMES ***			
⚠T691	45052110	POWER TRANS	1
⚠T652	46304101	TRANS CONVERTER	1
⚠T651	46310101	TRANSFORMER	1
T501	46399001	TRANS H DRIVE	1
⚠T502	47105166	F.B.T	1
*** VALIABLE RESISTOR ***			
VR174	41023401	R,VARIABLE 10K	1
VR172 VR173	41023402	R,VARIABLE 1K	2
VR175 VR176 VR177	41023403	R,VARIABLE 10K	5

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** VALIABLE RESISTOR ***			
VR178 VR179			
VR171	41023404	R,VARIABLE 5K	1
VR6101	41023451	R,VARIABLE 1K	1
VR331	41061014	R,VARIABLE 2.2K	1
VR401 VR701	41061505	R,VARIABLE 470H 0.15W	2
VR501 VR702	41061511	R,VARIABLE 4.7K	2
VR201	41061513	R,VARIABLE 10K 0.15W	1
VR180 VR181	41071113	R,VARIABLE 10K	2
VR902 VR903	41086302	R.VARIABLE 200H	2
VR903 VR905 VR906	41086307	R,VARIABLE 3K 0.1W	3
⚠VR651	41505004	R,VARABLE 1K	1
⚠VR2001	41505008	R.VARIABLE 10K 0.1W	1
*** SWITCHES ***			
S6102	65113012	SWITCH,SLIDE	1
S180	65199016	SWITCH SLIDE	1
S181	65199017	SWITCH SLIDE	1
S6103	65199018	SW,SLID	1
⚠S691	65208104	SEESAW SWITCH	1
S151 S152 S153	65361002	SWITCH,PUSH BUTTON	4
S154			
S177 S178 S179	65361005	SWICH PUSH	3
S155	65361010	SW,PUSH	1
S173 S174 S176	65399032	SWITCH PUSH	4
S182			
S171 S172 S175	65399033	SWITCH PUSH	4
S183			
⚠RL101	65602021	RELAY G4W-1112P-US-TV8-P	1
S401	66099003	LEVER SWITCH	1
*** COILS & FILTERS ***			
T201	60245006	V.IFT 2ND	1
T202	60253020	V.IFT P.BET	1
T203	60253021	V.IFT AFT	1
L703	60351003	COIL,TRAP 5.5MHZ	1
T701	60565014	COIL D,L	1
⚠L505	60917030	COIL,H.LIN	1
L702	610E1727	COIL,FILTER 68UHA,T (S)	1
L701	610E1730	COIL,FILTER 120UHA,T (S)	1
L653 L654	61005004	COIL,FILTER 5.6UH	2
L652	61011018	COIL,CHOKE	1
L201	61011039	COIL (A) R60	1
L202	61011048	COIL (B) 1R4	1
L705	61013013	COIL,FILTER 10UH	1

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** COILS & FILTERS ***			
L709	61013015	COIL,FILTER 15UH	1
L704	61013021	COIL,47UH	1
L205	61051517	COIL,FILTER	1
L901	61051530	COIL,FILTER 120UH	1
⚠ L651	61062014	COIL,LINE FILTER	1
L506	61064006	COIL FILTER 50UH	1
L521	61064051	COIL,FILTER 2200UH	1
L501 L504	61064055	COIL,FILTER 4.7UH	2
L102 L502	61066014	COIL,FILTER 5.6UH	2
L203 L204 L301	61067018	COIL,FILTER 12UH	6
L520 L720 L721			
L207	61067114	COIL,FILTER 5.6UH	1
CF301	61105011	COIL,FILTER 4.5MHZ	1
CF201	61107004	CERAMIC TRAP 4.5MHZ	1
CF151	61111009	CERAMIC RESONATOR	1
CF302	61112011	CERAMIC DISCRIMINATOR	1
FL201	61120032	VIF SAWF SAF45MH	1
⚠	61326102	COIL,DEGAUSSING	1
DL701	61511051	DELAY LINE	1
	61605005	FERRITE BEAD	2
	61605010	FERRITE BEAD	2
*** PWB ASSY ***			
	93E90H02	PHONE-JACK PWB ASSY	1
	*93E90M02	CONTROL PWB ASSY	1
	93E90W02	DC-PS PWB ASSY	1
	*93F10C01	TUN-IF PWB ASSY	1
	*93F10N02	AV-INT PWB ASSY	1
	*93F10T03	CH-TIME LED PWB ASSY	1
	93F24F01	MAIN PWB ASSY	1
	93F24G01	VIDEO CRT PWB ASSY	1
*** MISCELLANEOUS PARTS ***			
LC201 LC202 LC203	39021001	COIL,TRAP 177MHZ	4
LC204			
FR153	39030004	R.NETWORK1/8W 7X100KM	1
FR102	39030008	R,NETWORK 1/8W 5X10KM	1
FR101	39030019	R,NETWORK R1/8W 7X10KM	1
FR152	39030039	R.NETWORK 4X33KM	1
CT101	44208004	C,TRIMER 30PF	1
	63010204	SPEAKER 128X77MM 16H 3W	1
X701	64003011	X.TAL 3.579MHZ	1
X101	64003012	CRYSTAL 4.5MHZ	1

SYMBOL	PARTS NO	DESCRIPTION	QTY
*** MISCELLANEOUS PARTS ***			
⚠F651	66651403	FUSE 4A T 125V UL 30MM	1
⚠F652	66651404	FUSE 2A	1
⚠	70032222	SG/CRT SOCKET	1
	70051052	PIN JACK	3
	70051075	PIN JACK 1P	2
	70051091	PIN JACK 1P (R)	2
	70051092	PIN JACK 1P (W)	2
	70051093	PIN JACK 1P (Y)	2
	70101015	SOCKET,TR	1
	70102010	SOCKET,IC 28PIN	1
	70102019	IC SOCKET 22P	1
	70505025	EARPHONE JACK	1
	70507008	JACK,HEADPHONE	1
⚠	70899003	LINE CORD SPT-2	1
⚠	71110907	MATCHING BOX,300-75FP	1
⚠	71121871	TARMINAL ANTENNER (UL)	1
	71205036	HOLDER,FUSE	4
	79602921	PHOTO SENS UNIT	1
	79603561	REMO-T HANDUNIT	1
*** APPEARANCE PARTS ***			
	24321931	CABINET BACK	1
	24364401	CABINET	1
	24443971	PANEL FRONT	1
	24444031	SPEAKER GRIL (R)	1
	24444041	SPEAKER GRIL (L)	1
*** KNOB & PUSH BUTTONS ***			
	24469711	BUTTON PUSH D	2
	24469721	BUTTON PUSH	2
	24469751	BUTTON PUSH D	7
	24470181	BUTTON PUSH A	1
*** PACKING MATERIALS ***			
	24806961	BAG,POLYETHYLENE	1
	24824141	BAG PROTECTION	1
	24827981	FILLER CARTON A	1
	24827991	FILLER CARTON B	1
	24829371	PLATE PROTECTOR	1
	24829381	CARTON BOX	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
	*** RESISTOR ***				
R301			400K3525	R/SOLID 100H 10% 1/2W	1
R217			400K3526	R/SOLID 120H 10% 1/2W	1
R228	R6136		400K3529	R/SOLID 220H 10% 1/2W	2
R527			400K3537	R/SOLID 1.0K 10% 1/2W	1
R418			400K3540	R/SOLID 1.8K 10% 1/2W	1
R515			400K3545	R/SOLID 4.7K 10% 1/2W	1
⚠R540	R662	R904	40003042	R/SOLID 2.7K 10% 1/2W	5
R905	R906				
R673	R674		40003047	R/SOLID 6.8K 10% 1/2W	2
R414			40003056	R/SOLID 39K 10% 1/2W	1
R665	R672	R692	40003065	R/SOLID 220K 10% 1/2W	3
⚠R691			40003073	R/SOLID 1.0M 10% 1/2W	1
R6993	R6994		40003145	R/SOLID 68H 5% 1/2W	2
R6991	R6992		40003159	R/SOLID 270H 5% 1/2W	2
R511			40003532	R/SOLID 390H 10% 1/2W	1
R519			40003561	R/SOLID 100K 10% 1/2W	1
R912			40023073	R/SOLID 1.0M 10% 1/2W	1
⚠R681			40023077	R/SOLID 2.2M 10% 1/2W	1
R6122	R6174		401C6625	R/CARBON 10H 5% 1/4W	2
R6130			401C6637	R/CARBON 33H 5% 1/4W	1
R204			401C6641	R/CARBON 47H 5% 1/4W	1
R113	R127	R308	401C6649	R/CARBON 100H 5% 1/4W	3
R6123	R6126		401C6651	R/CARBON 120H 5% 1/4W	2
R213	R304		401C6659	R/CARBON 270H 5% 1/4W	2
R221	R305		401C6661	R/CARBON 330H 5%1/4W	2
R6131			401C6663	R/CARBON 390H 5% 1/4W	1
⚠R205	R6132	R6173	401C6665	R/CARBON 470H 5% 1/4W	3
R201	R206		401C6667	R/CARBON 560H 5% 1/4W	2
R140			401C6669	R/CARBON 680H 5% 1/4W	1
R112	R114	R115	401C6673	R/CARBON 1.0K 5% 1/4W	23
R125	R135	R151			
R152	R202	R208			
R215	R222	R224			
R225	R231	R302			
R306	R6118	R6129			
R6133	R6167	R6168			
R6169	R6170				
R109	R6113	R6115	401C6677	R/CARBON 1.5K 5% 1/4W	4
R6117					
R110	R207	R212	401C6679	R/CARBON 1.8K 5% 1/4W	5
R214	R219				
R145	R149	R150	401C6681	R/CARBON 2.2K 5% 1/4W	7
R160	R220	R307			
R309					
R146	R6139	R6140	401C6683	R/CARBON 2.7K 5% 1/4W	4
R6157					
R119	R120	R227	401C6685	R/CARBON 3.3K 5% 1/4W	5
R6128	R6134				

SYMBOL			PARTS NO	DESCRIPTION	QTY
	*** RESISTOR ***				
R218	R303		401C6687	R/CARBON 3.9K 5% 1/4W	2
R123	R131	R6101	401C6689	R/CARBON 4.7K 5% 1/4W	9
R6109	R6114	R6116			
R6158	R6171	R6172			
R6127			401C6691	R/CARBON 5.6K 5% 1/4W	1
R211			401C6693	R/CARBON 6.8K 5% 1/4W	1
R6135			401C6695	R/CARBON 8.2K 5% 1/4W	1
R117	R118	R132	401C6697	R/CARBON 10K 5% 1/4W	19
R133	R136	R226			
R6104	R6105	R6106	401C6697	R/CARBON 10K 5% 1/4W	19
R6107	R6110	R6112			
R6151	R6152	R6153			
R6154	R6155	R6156			
R6166					
R121			401C6701	R/CARBON 15K 5% 1/4W	1
R101	R103	R147	401C6705	R/CARBON 22K 5% 1/4W	7
R148	R6103	R6108			
R6111					
R6102			401C6709	R/CARBON 33K 5% 1/4W	1
R116			401C6711	R/CARBON 39K 5%	1
R111	R209	R210	401C6719	R/CARBON 82K 5% 1/4W	3
R108	R6125	R6141	401C6721	R/CARBON 100K 5% 1/4W	17
R6142	R6143	R6144			
R6145	R6146	R6147			
R6149	R6159	R6160			
R6161	R6162	R6163			
R6164	R6165				
R6148	R6150		401C6723	R/CARBON 120K 5% 1/4W	2
R144			401C6725	R/CARBON 150K 5% 1/4W	1
R216			401C6737	R/CARBON 470K 5%	1
R422			401K5613	R/CARBON 3.3H 5% 1/6W	1
R413			401K5631	R/CARBON 18H 5% 1/6W	1
R708			401K5641	R/CARBON 47H 5% 1/6W	1
R410			401K5643	R/CARBON 56H 5% 1/6W	1
R362	R365	R421	401K5649	R/CARBON 100H 5% 1/6W	4
R786					
R727			401K5651	R/CARBON 120H 5% 1/6W	1
R330	R352	R354	401K5653	R/CARBON 150H 5% 1/6W	4
R356					
R408	R733		401K5655	R/CARBON 180H 5% 1/6W	2
R331	R349	R351	401K5657	R/CARBON 220H 5% 1/6W	3
R512	R514	R531	401K5661	R/CARBON 330H 5% 1/6W	8
R715	R716	R775			
R777	R779				
R726	R780		401K5663	R/CARBON 390H 5% 1/6W	2
R734	R790		401K5665	R/CARBON 470H 5% 1/6W	2
R513	R711	R713	401K5667	R/CARBON 560H 5% 1/6W	6
R714	R721	R781			

SYMBOL			PARTS NO	DESCRIPTION	QTY
	*** RESISTOR ***				
R707	R763		401K5669	R/CARBON 680H 5% 1/6W	2
R766	R794		401K5671	R/CARBON 820H 5% 1/6W	2
⚠R2001	R339	R343	401K5673	R/CARBON 1K 5% 1/6W	14
R348	R357	R704			
R705	R720	R723			
R729	R732	R746			
R747	R768				
R728	R789				
R717	R731	R767	401K5675	R/CARBON 1.2K 5% 1/6W	2
R795	R797		401K5677	R/CARBON 1.5K 5% 1/6W	5
R706	R755				
R340	R709	R748	401K5679	R/CARBON 1.8K 5% 1/6W	2
R784	R785		401K5681	R/CARBON 2.2K 5% 1/6W	5
R341					
R510	R736	R774	401K5683	R/CARBON 2.7K 5% 1/6W	1
R776	R778	R787	401K5685	R/CARBON 3.3K 5% 1/6W	6
R	R358	R359			
R361	R364	R409	401K5689	R/CARBON 4.7K 5% 1/6W	9
R506	R742	R743			
R332	R353	R355	401K5691	R/CARBON 5.6K 5% 1/6W	11
R404	R406	R738			
R749	R756	R758			
R773	R791				
⚠R405	R419	R503	401K5693	R/CARBON 6.8K 5% 1/6W	5
R712	R782				
R350	R761		401K5695	R/CARBON 8.2K 5% 1/6W	2
R338	R342	R367	401K5697	R/CARBON 10K 5% 1/6W	20
R369	R407	R507			
R509	R719	R724			
R725	R750	R751			
R752	R754	R757			
R762	R765	R769			
R771	R772				
R505	R739				
⚠R2002	R703		401K5699	R/CARBON 12K 5% 1/6W	2
R360	R363	R710	401K5701	R/CARBON 15K 5% 1/6W	2
R526	R718	R753	401K5703	R/CARBON 18K 5% 1/6W	3
R412			401K5705	R/CARBON 22K 5% 1/6W	3
R334	R411	R702	401K5706	R/CARBON 24K 5% 1/6W	1
R793	R796		401K5707	R/CARBON 27K 5% 1/6W	5
R420	R502				
R337	R344	R346	401K5709	R/CARBON 33K 5% 1/6W	2
R528	R740		401K5711	R/CARBON 39K 5% 1/6W	5
R345	R347	R403			
R508	R529	R701	401K5713	R/CARBON 47K 5% 1/6W	8
R737	R759				
R760			401K5715	R/CARBON 56K 5% 1/6W	1
R504			401K5717	R/CARBON 68K 5% 1/6W	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
	*** RESISTOR ***				
R335	R741		401K5719	R/CARBON 82K 5% 1/6W	2
R333	R336	R735	401K5721	R/CARBON 100K 5% 1/6W	5
R764	R792				
R783			*401K5725	R/CARBON 150K 5% 1/6W	1
R770			401K5729	R/CARBON 220K 5% 1/6W	1
R788			401K5737	R/CARBON 470K 5% 1/6W	1
R425			40106179	R/CARBON 1.8K 5% 1/3W	1
R423			40106187	R/CARBON 3.9K 5% 1/3W	1
R229			40136137	R/CARBON 33H 5% 1/4W	1
R6119	R6120	R6124	40136146	R/CARBON 75H 5% 1/4W	5
R6137	R6138				
R174	R910		40136149	R/CARBON 100H 5% 1/4W	2
R660	R907	R908	40136153	R/CARBON 150H 5% 1/4W	4
R909					
R151	R152	R153	40136159	R/CARBON 270H 5% 1/4W	11
R154	R155	R156			
R157	R164	R165			
R166	R799				
R658			40136167	R/CARBON 560H 5% 1/4W	1
R158	R161	R798	40136173	R/CARBON 1.0K 5% 1/4W	3
R171	R172	R173	40136175	R/CARBON 1.2K 5% 1/4W	4
R175					
R657			40136177	R/CARBON 1.5K 5% 1/4W	1
⚠R664			40136179	R/CARBON 1.8K 5% 1/4W	1
R203	R915	R916	40136183	R/CARBON 2.7K 5% 1/4W	4
R917					
⚠R663			40136191	R/CARBON 5.6K 5% 1/4W	1
R162	R163		40136197	R/CARBON 10K 5% 1/4W	2
R659			40136199	R/CARBON 12K 5% 1/4W	1
R160			40136213	R/CARBON 47K 5% 1/4W	1
R3	R5298		40136221	R/CARBON 100K 5% 1/4W	2
R159			*40136239	R/CARBON 560K 5% 1/4W	1
R161			40136649	R/CARBON 100H 5% 1/4W	1
R230			40136679	R/CARBON 1.8K 5% 1/4W	1
R			40136687	R/CARBON 3.9K 5% 1/4W	1
R			40136697	R/CARBON 10K 5% 1/4W	1
R			40136699	R/CARBON 12K 5% 1/4W	1
R533					
R223			*40136711	R/CARBON 39K 5% 1/4W	1
⚠R143			*40146169	R/CARBON 680H 5% 1/4W	1
R520			40177101	R/CARBON 1H 5% 1/4W	1
⚠R523			40177173	R/CARBON 1.0K 5% 1/4W	1
R693			40178101	R/CARBON 1H 5% 1/2W	1
R654			40216038	R/WIRE 1.5H 10% 7W	1
R153			40318053	R/METAL 22K 10% 5W	1
R139			40351147	R/METAL 82H 5% 1W	1
			40351151	R/METAL 120H 5% 1W	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
			*** RESISTOR ***		
R137	R141		40351155	R/METAL 180H 5% 1W	2
R901	R902	R903	40351201	R/METAL 15K 5% 1W	3
R651			40352127	R/METAL 12H 5% 2W	1
R655			40352133	R/METAL 22H 5% 2W	1
R134			40352191	R/METAL 5.6K 5% 2W	1
R424			40371133	R/METAL 22H 5% 1W	1
R521			*40372110	R/METAL 2.4H 5% 2W	1
R532			*40372127	R/METAL 12H 5% 2W	1
R525			40372155	R/METAL 180H 5% 2W	1
R415			40372185	R/METAL 3.3K 5% 2W	1
R516			40372189	R/METAL 4.7K 5% 2W	1
R501			40372197	R/METAL 10K 5% 2W	1
⚠R142	R2003	R518	40405109	R/METAL 2.2H 5% 1/4W	4
⚠R524					
⚠R366	R368	R517	40405117	R/METAL 4.7H 5% 1/4W	3
⚠R	R401	R722	40405125	R/METAL 10H 5% 1/4W	4
R744					
⚠R370			40405141	R/METAL 47H 5% 1/4W	1
R661			40405143	R/METAL 56H 5% 1/4W	1
R656			40499002	R/METAL 1.0H 5% 2W	1
			*** CAPACITORS ***		
C511			420C9560	C/CERAMIC 500V 560PF	1
⚠C416	C514	C518	420C9567	C/CERAMIC 500V 2200PF	5
C519	C524				
C657	C674	C901	4201J575	C/CERAMIC 500V 0.01UF	3
C902			42022113	C/CERAMIC 1KV 1000PF	1
C413			4203J556	C/CERAMIC 500V 270PF	1
C415	C512		4203J575	C/CERAMIC 500V 0.01UF	2
C659A			*42053013	C/CERAMIC 400V 1000PF	1
⚠C664	C665	C666	42099029	C/CERAMIC 125V 4700PF	4
⚠C667					
C659			42099060	C/CERAMIC 500V 1000PF	1
⚠C683	C684		42099061	C/CERAMIC 160V 4700PF	2
C404	C509	C723	421C0213	C/CERAMIC 50V 1000PF	3
C711	C729	C731	421C0225	C/CERAMIC 50V 0.01UF	4
C745					
C205	C206	C302	421C1025	C/CERAMIC 25V 0.01UF	4
C303					
C201	C202	C204	421C1067	C/CERAMIC 50V 2200PF	4
C211					
C713			4213K207	C/CERAMIC 50V 330PF	1
C160	C161	C162	4213K210	C/CERAMIC 50V 560PF	6
C163	C164	C166			
C739	C903	C904	4213K215	C/CERMIC 50V 1500PF	4

SYMBOL			PARTS NO	DESCRIPTION	QTY
			*** CAPACITORS ***		
C905					
C208	C210	C213	4213K217	C/CERMIC 50V 2200PF	4
C761			4213K217	C/CERMIC 50V 2200PF	4
C219			4213K225	C/CERAMIC 50V 0.01UF	1
C165	C167	C168	*42130710	C/CERAMIC 50V 560PF	3
C217			4219J002	C/CERAMIC 50V 0.1UF	1
C	C592	C641	42299012	C/CERAMIC 2KV 220PF	3
C702	C703	C708	423A1033	C/CERAMIC 50V 33PF	4
C710					
C349	C354	C724	423A1045	C/CERAMIC 50V 100PF	4
C752					
C733	C734	C735	423A1051	C/CERAMIC 50V 180PF	3
C420			423A1053	C/CERAMIC 50V 220PF	1
C738			423A2045	C/CERAMIC 50V 100PF	1
C760			4231A037	C/CERAMIC 50V 47PF	1
C709			4231A049	C/CERAMIC 50V 150PF	1
C530			4231A053	C/CERAMIC 50V 220PF	1
C			4231B013	C/CERAMIC 50V 8PF	1
C231			4231B015	C/CERAMIC 50V 10PF	1
C203			4231B023	C/CERAMIC 50V 12PF	1
C717			4231B037	C/CERAMIC 50V 47PF	1
C732			4231B063	C/CERAMIC 50V 18PF	1
C748			4231B064	C/CERAMIC 50V 20PF	1
C750			4231B065	C/CERAMIC 50V 22PF	1
C747			4231B067	C/CERAMIC 50V 27PF	1
C746			4231B071	C/CERAMIC 50V 39PF	1
C153	C305		4231B075	C/CERAMIC 50V 56PF	2
C102			4231B076	C/CERAMIC 50V 62PF	1
C154			4231B079	C/CERAMIC 50V 82PF	1
C230			*42331049	C/CERAMIC 50V 150PF	1
C407	C408		427E6010	C/FILM 50V 0.033UF	2
C508			427E6051	C/FILM 50V 1000PF	1
C419			42703567	C/FILM 200V 0.022UF	1
C523B			42703869	C/FILM 400V 0.033UF	1
C402			4275D002	C/FILM 50V 1500PF	1
C109	C110	C126	4275D007	C/FILM 50V 0.01UF	6
C133	C152	C704			
C406			4275D012	C/FILM 50V 0.068UF	1
C103	C104		4275D013	C/FILM 50V 0.1UF	2
C306	C352	C357	4275D053	C/FILM 50V 1500PF	3
C504			4275D059	C/FILM 50V 4700PF	1
C503	C652		4275D060	C/FILM 50V 5600PF	2
C127	C139	C350	4275D063	C/FILM 50V 0.01UF	5
C355	C401				
C138	C6103		4275D071	C/FILM 50V 0.047UF	2
C111			4275F117	C/FILM 50V 0.022UF	1

SYMBOL			PARTS NO	DESCRIPTION	QTY
			*** CAPACITORS ***		
C507	C749		4275F119	C/FILM 50V 0.033UF	2
C506			4275F121	C/FILM 50V 47000PF	1
C359	C360	C675	4275F125	C/FILM 50V 0.1UF	4
C676					
C654			42754409	C/FILM 400V 0.022UF	1
C678			*42754517	C/FILM 50V 0.47UF	1
C6111	C6112		*42756119	C/FILM 50V 0.033UF	2
C513			42808027	C/METAL FILM 1.6K 0.012UF	1
C517			42839022	C/METAL FILM 250V 0.1UF	1
⚠C523			*42899015	C/METAL FILM 400V 0.47UF	1
⚠C681	C682		42899016	C/METAL FILM 125V 0.01UF	2
⚠C669			42899025	C/METAL FILM 125V 0.1UF	1
C655			42899046	C/METAL FILM 100V 2.2UF	1
C339	C342	C510	430A4101	C/ELEC 50V 0.22UF	3
C334			430A4103	C/ELEC 50V 0.47UF	1
C741			430A4105	C/ELEC 50V 1UF	1
⚠C2001	C331	C340	430A9025	C.ELEC 16V 10UF	13
C341	C403	C701			
C705	C706	C718			
C719	C737	C744			
C751					
C333			430A9027	C.ELEC 16V 33UF	1
C343	C353	C358	430A9028	C/ELEC 16V 47UF	6
C712	C714	C716			
C501			430A9029	C/ELEC 16V 100UF	1
C720	C727		430A9037	C/ELEC 25V 4.7UF	2
C412			430A9038	C.ELEC 25V 10UF	1
C348	C351	C356	430A9042	C/ELEC 25V 100UF	3
C337	C338	C410	430A9061	C/ELEC 50V 1UF	5
C721	C725				
C505			430A9062	C.ELEC 50V 2.2UF	1
C344	C345	C502	430A9063	C/ELEC 50V 3.3UF	7
C707	C726	C728			
C742					
⚠C2002	C722		430A9065	C/ELEC 50V 10UF	2
C526			4300E127	C/ELEC 160V 100UF	1
C105	C332		4301D099	C/ELEC 50V 0.1UF	2
C125	C209		4301D103	C/ELEC 50V 0.47UF	2
C6102	C6123		4301D105	C/ELEC 50V 1UF	2
C112			4301D107	C/ELEC 50V 2.2UF	1
C6105	C6109	C6110	4301J019	C.ELEC 10V 470UF	3
C113	C214	C304	4301J025	C/ELEC 16V 10UF	16
C6108	C6113	C6114			
C6115	C6116	C6117			
C6118	C6119	C6120			
C6121	C6122	C743	4301J025	C/ELEC 16V 10UF	16
C753					

SYMBOL			PARTS NO	DESCRIPTION	QTY
			*** CAPACITORS ***		
C106	C212		4301J026	C.ELEC 16V 22UF	2
C762			4301J027	C/ELEC 16V 33UF	1
C207	C301	C6106	4301J028	C/ELEC 16V 47UF	4
C6107					
C114	C124	C131	4301J029	C.ELEC 16V100UF	6
C151	C215	C307			
C123	C135		4301J030	C.ELEC 16V220UF	2
C216	C361	C362	4301J032	C/ELEC 16V 470UF	9
C409	C527	C6101			
C6124	C6125	C730			
C715			4301J033	C/ELEC 16V 1000UF	1
C128			4301J045	C/ELEC 25V 470UF	1
C121			4301J046	C/ELEC 25V 1000UF	1
C418			4301J055	C.ELEC 35V 220UF	1
C134	C155	C364	4301J061	C/ELEC 50V 1UF	3
C122			4301J069	C.ELEC 50V 100UF	1
C417			4301J101	C.ELEC 100V 47UF	1
C6104			43019028	C.ELEC 16V 47UF	1
C673			43019033	C/ELEC 16V 1000UF	1
C363			*43019035	C.ELEC 16V 3300UF	1
C			43019060	C/ELEC 50V 0.47UF	1
C754			43019062	C.ELEC 50V 2.2UF	1
C116	C120		*4302C046	C/ELEC 16V 10UF	2
C522			4302C053	C ELEC 16V 470UF	1
C525			*4302C066	C/ELEC 25V 10UF	1
C521			*4302C072	C/ELEC 25V 330UF	1
C651			4302C106	C.ELEC 50V 10UF	1
C515	C516	C520	4309J040	C.ELEC 160V 10UF	3
C414			4309J056	C/ELEC 500V 2.2UF	1
C671	C677		4309J064	C.ELEC 160V 100UF	2
C107			43099063	C/ELEC 5V 47000UF	1
C672			43104036	C.ELEC 25V 2200UF	1
C656			43104078	C/ELEC 200W 680UF	1
C335	C336		433A1023	C/ELEC 25V 10UF	2
C411			435A5055	C/TANTALUM 16V 10UF	1
C405			435A5071	C/TANTALUM 35V 1UF	1
C108			43515065	C/TANTALUM 35V 0.1UF	1

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